April, 1955
TECHNOLOGY DEPT.
TWO SHILLINGS & SIXPENCE

Plastics

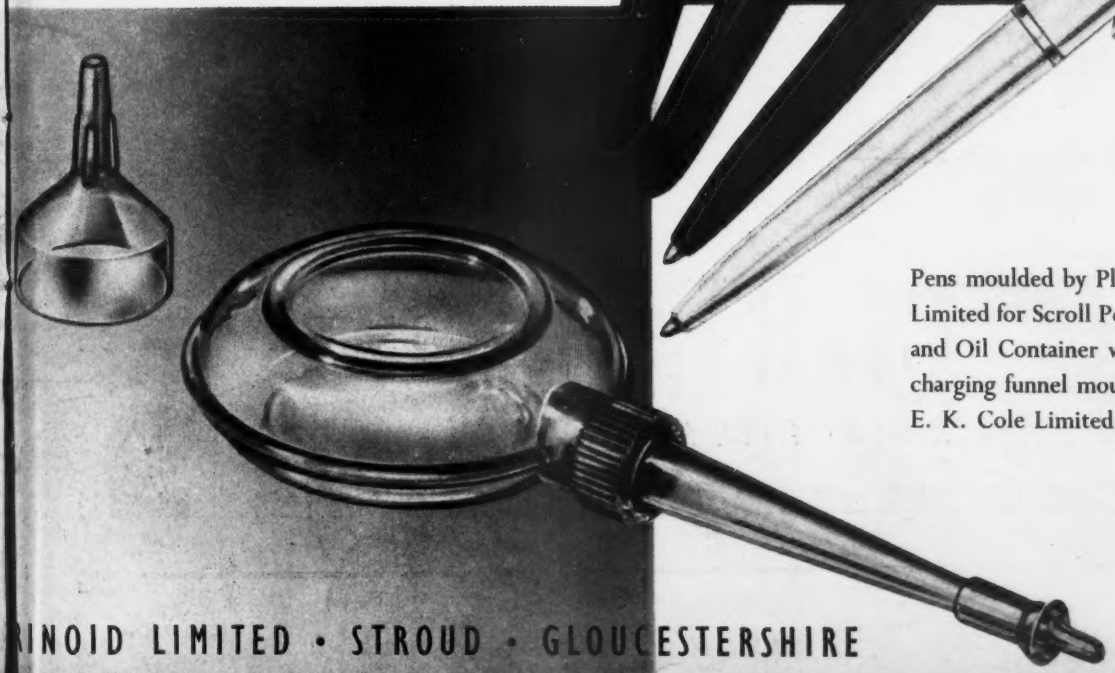
DEALING WITH THE MANUFACTURE, USES AND POTENTIALITIES OF PLASTIC MATERIALS

mouldings in

Erinoid

Cellulose Acetate Powders

Pens moulded by Plasmic Limited for Scroll Pens Limited, and Oil Container with charging funnel moulded by E. K. Cole Limited.



INOID LIMITED • STROUD • GLOUCESTERSHIRE

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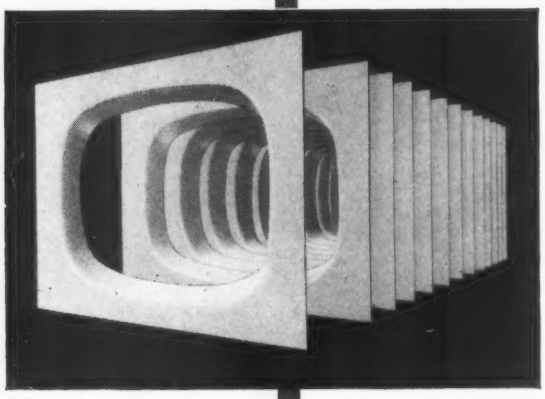
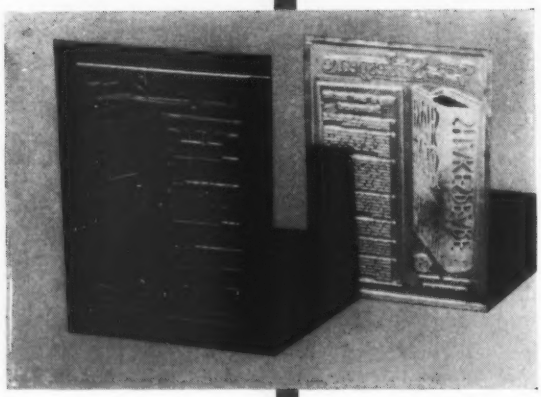
in the long run...



COBEX MEANS CONSISTENCY

Continuous mass-production of articles like television masks, trays, sinks, lighting fixtures etc., is daily proving COBEX a moulding material whose toughness, lightness and stability are not only outstanding but outstandingly *uniform!*

...or the short



COBEX MEANS ECONOMY

—even on very limited runs, like those required for matrices in printing, as the capital outlay necessary for COBEX moulding is exceptionally modest. COBEX rigid vinyl sheet neither burns nor smoulders; it resists most chemical reagents and it can be machined in the same manner as wood. Try Cobex and satisfy yourself.

BX **COBEX** Regd. **—MEANS BETTER MOULDING**

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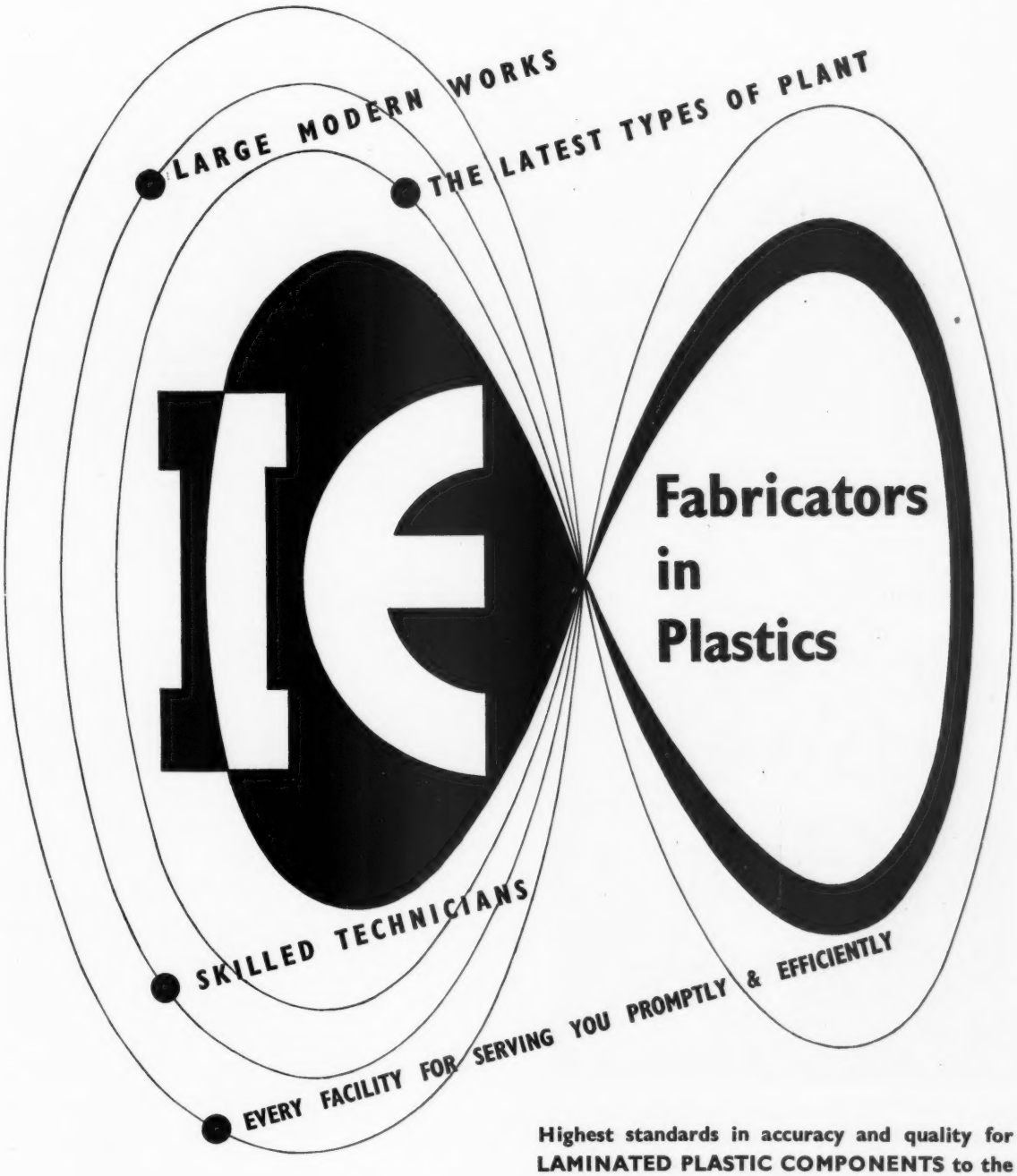

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A

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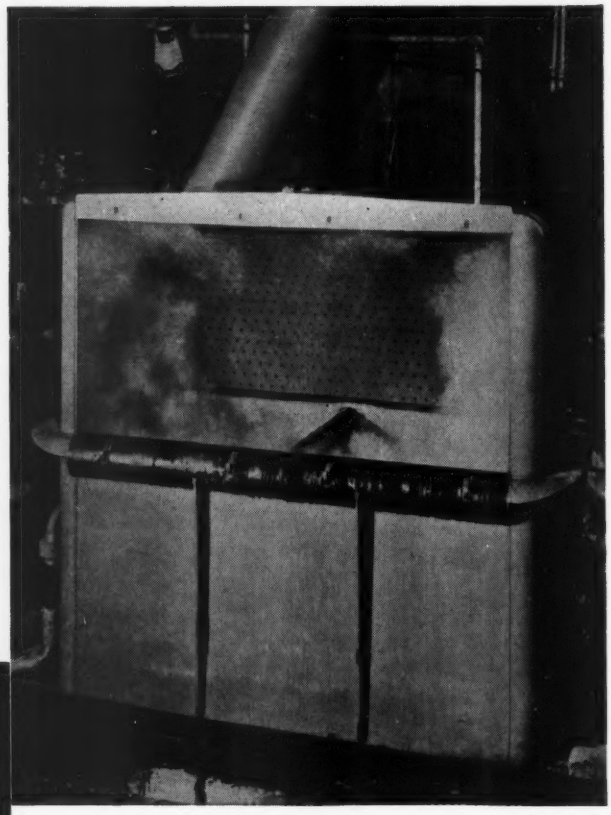

with Geon PVC

Acid Pickling and
Bright Dipping Cabinet and Duct Pipe
made by
Plastic Constructions Ltd.
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Both this acid pickling and bright dipping cabinet and the duct pipe are constructed with rigid Geon PVC. Geon PVC was used because it is chemically inert . . . is completely resistant to corrosion and never needs painting. Wherever there is risk of acid attack . . . in plating shops, chemical works, refineries or laboratories . . . corrosion can be totally defeated by employing Geon PVC.

For more information about Geon PVC write for descriptive Booklet No. 51.

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Polyvinyl Materials

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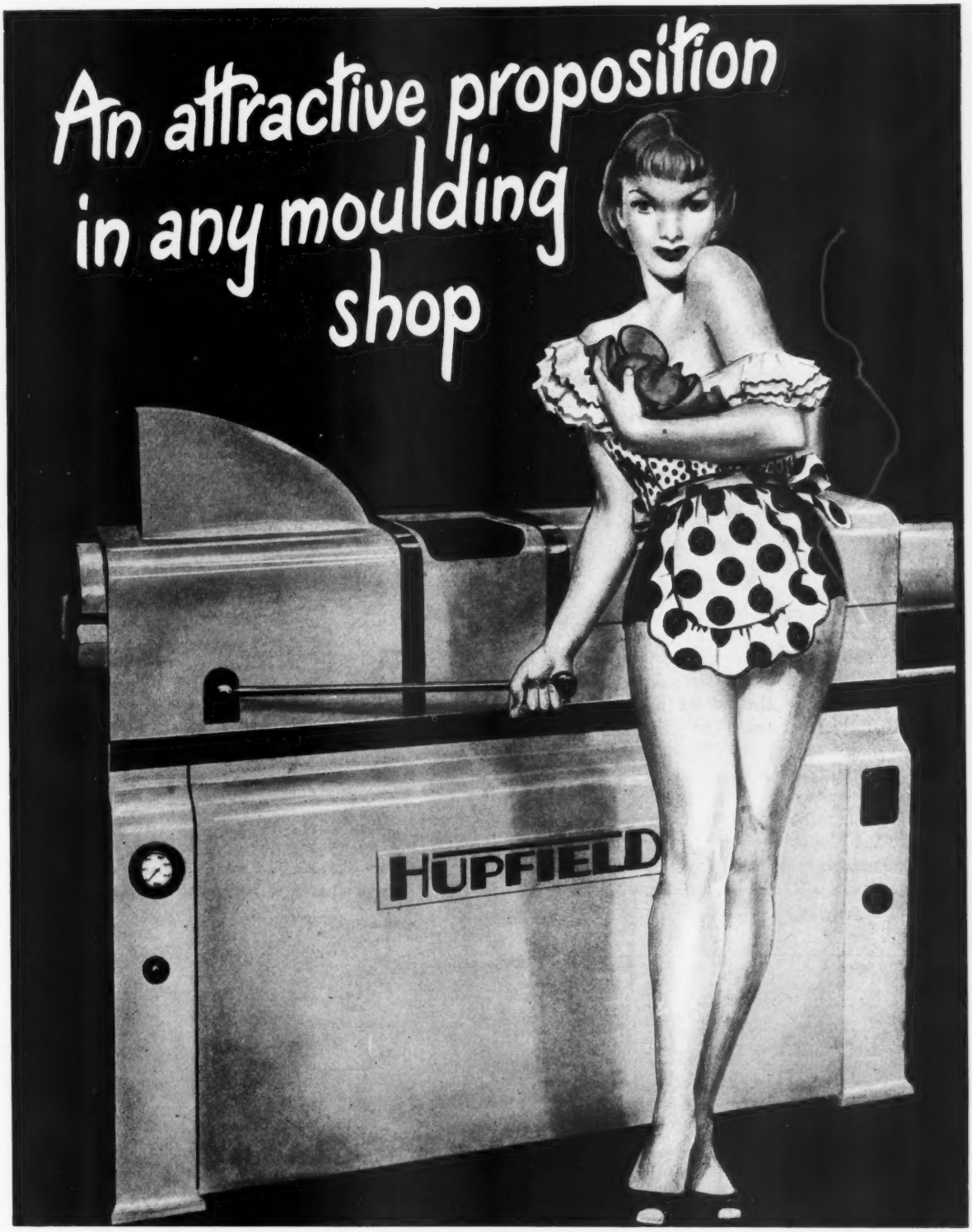

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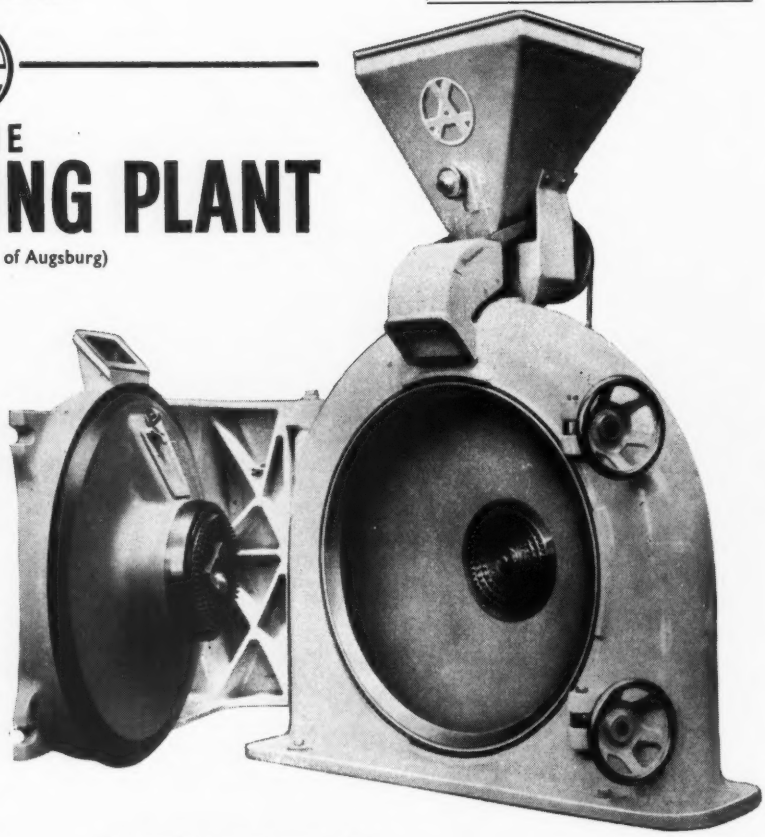
FINE GRINDING PLANT
(Made by Alpine A.G., of Augsburg)



CONTRAPLEX
WIDE CHAMBER GRINDER
with contra-rotating discs

This sieveless stud mill, which has been operating on the continent with remarkable success, will grind all soft and medium hard materials to a high degree of fineness.

A free flow of material is maintained between intermeshing studs on two discs rotating at speeds up to 12,000 r.p.m., the impact at these high velocities breaking up the material into the finest particles at relative speeds equal to 210 metres per sec. The discs have variable speeds and can rotate in either direction so that the widest range of materials can be ground. The wide chamber avoids build up of the fine particles on the chamber walls and for special materials additional air can be introduced for extra cooling or drying.

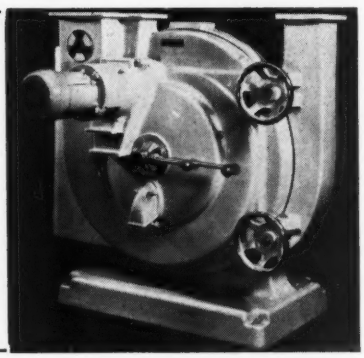
The special design permits high speeds with maximum safety. SUITABLE FOR A WIDE RANGE OF PRODUCTS including: CHEMICALS, dry or wet · SOAP CHIPS & FLAKES · WAXES PIGMENTS · SYNTHETICS · DAIRY PRODUCTS COCOA · OIL FRUITS · SPICES · DRUGS · RESINS INSECTICIDES, etc.

KOLLOPLEX
A high speed sieveless grinder for fine and ultra-fine pulverising of soft or medium hard materials, with controlled automatic vibration feed.

BIPLEX
High speed shearing and friction disc mill with toothed discs of hardened steel, natural or synthetic stone or of special construction for grinding and granulating. Adjustable clearance.

AIR CLASSIFIERS AND SEPARATORS
For use in conjunction with the Grinders or as separate units

Air classifiers and separators for any desired fineness down to 2·5 microns. Used in conjunction with mills they ensure a uniformity of output to the degree of fineness selected and with very sharp separation.



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No damage, no loss. White lead, protected by Polythene does not deteriorate in the drum. There is no waste from tipping or scooping out. Mersey White Lead is sealed and protected for as long as it is in the container.

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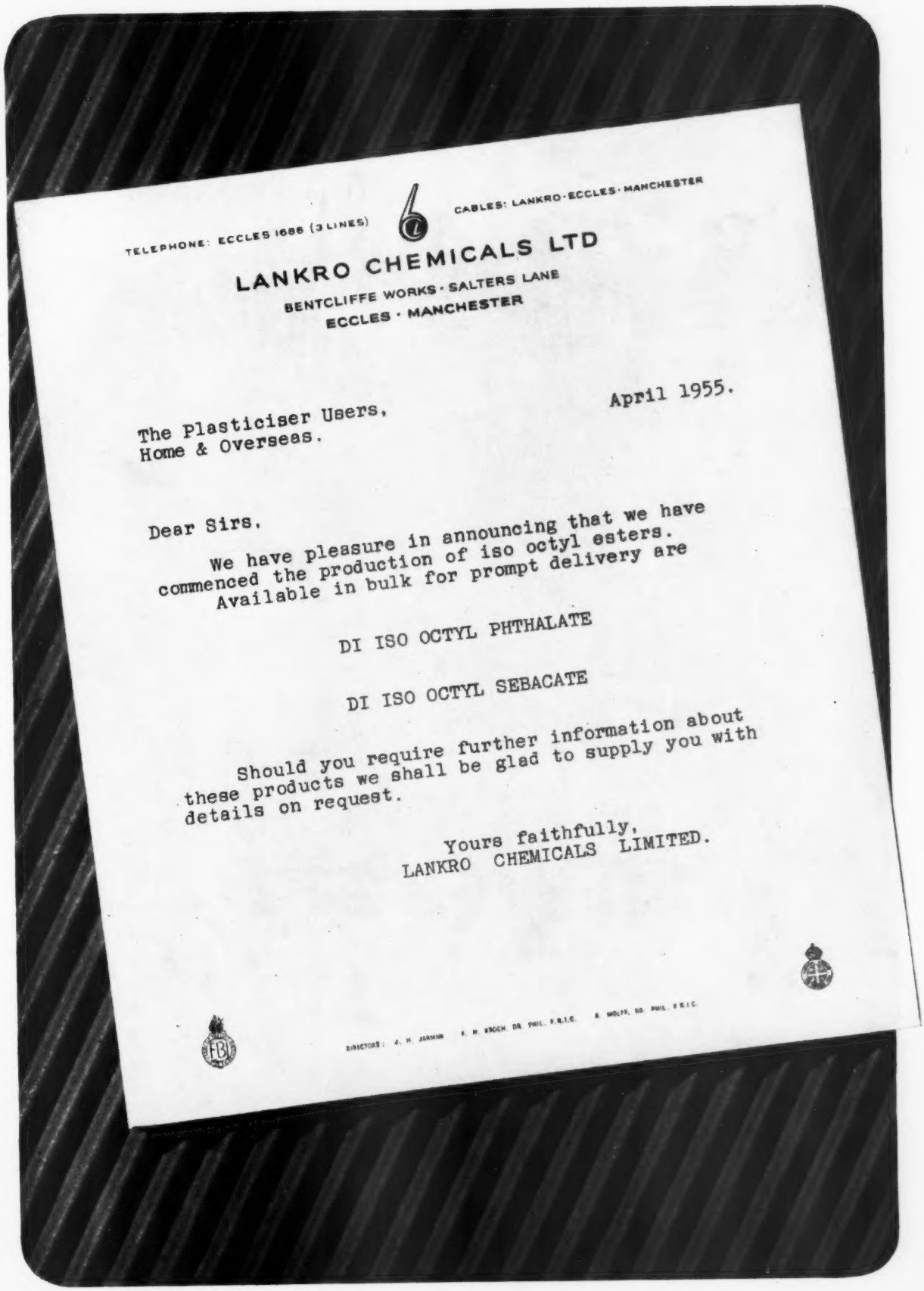

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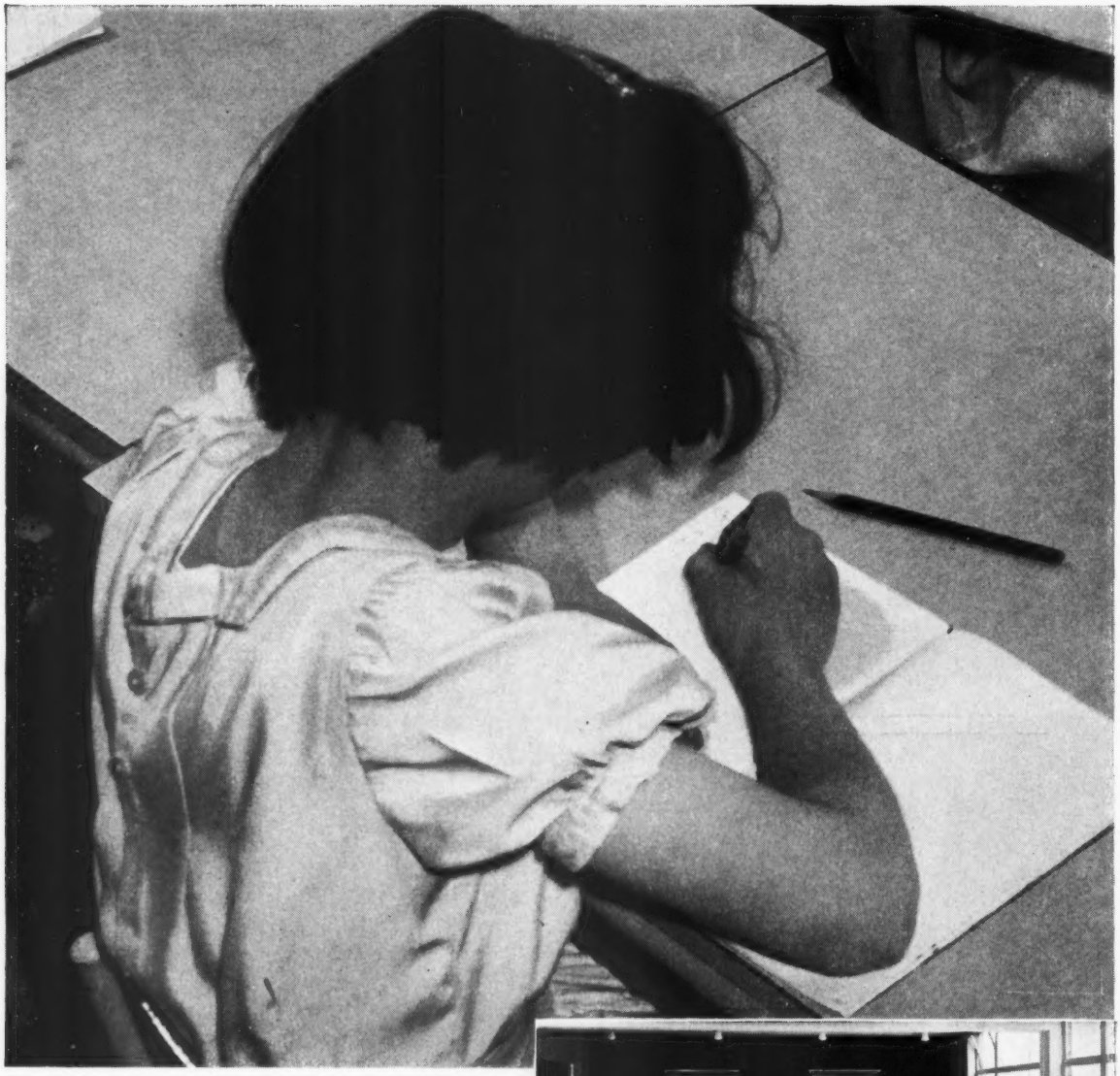
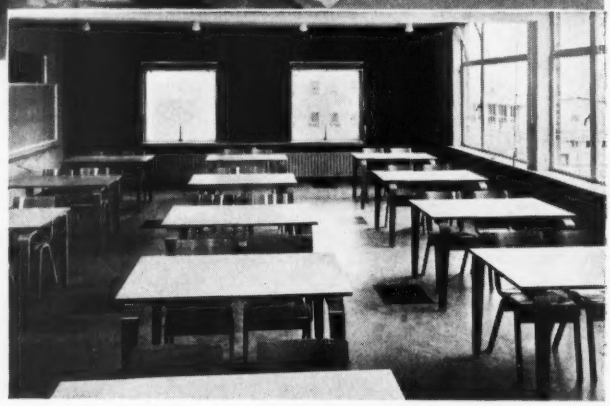


This little girl can draw, write and spill paint on this new table-top. A quick wipe will make it clean—and it will then be used for dining.



Photographs by courtesy of Thomas De La Rue Ltd.

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NEW SCHOOL

At the new Kidbrooke School in Greenwich—the L.C.C.'s first Comprehensive School—new table-tops perform a double function. They are used not only for lessons but for dining too.

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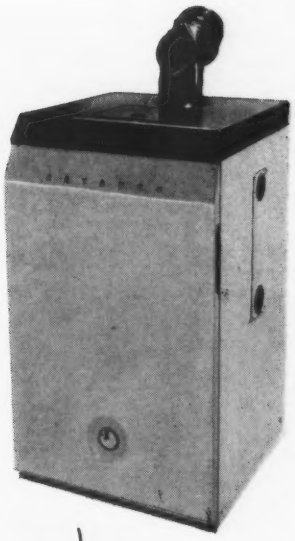

that's fixed that!

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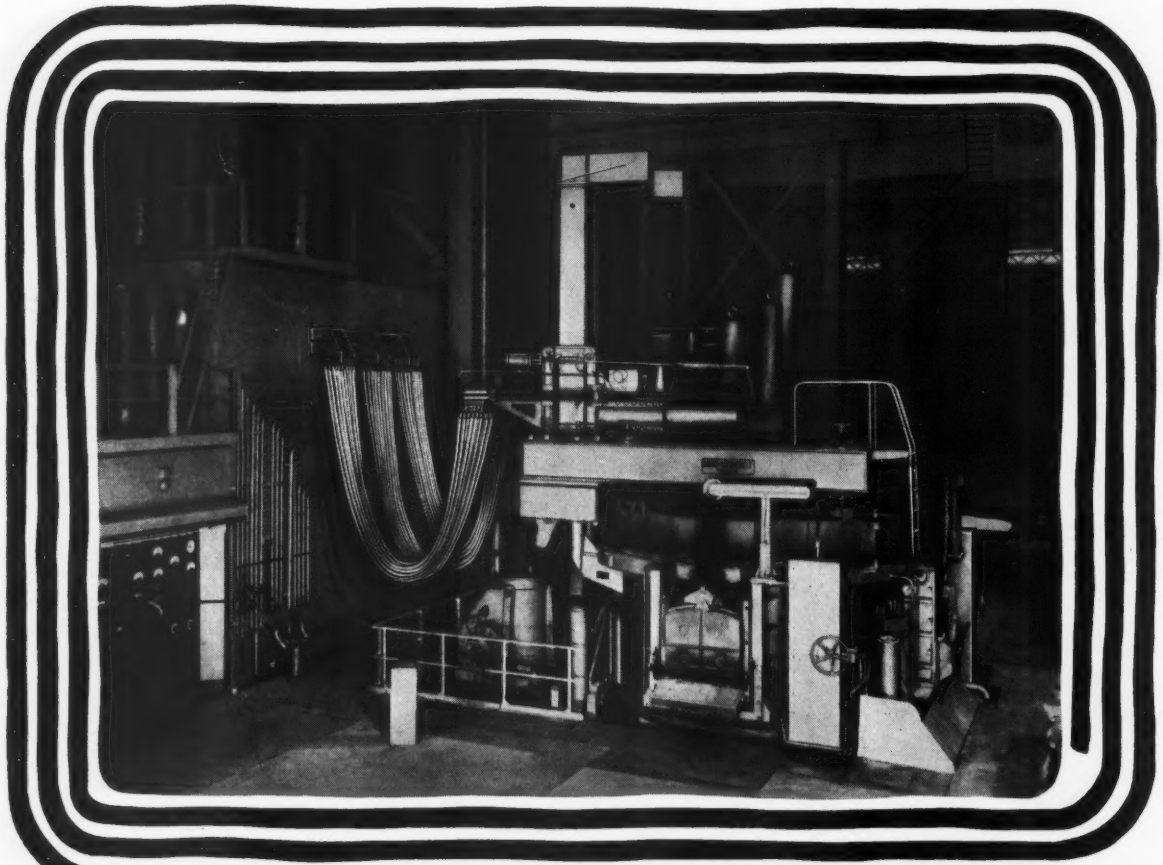

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In every industry or trade, electrical equipment is the key to modern production methods. There are probably more production-boosting and money-saving devices than you know of. Your Electricity Board can help you and give you sound advice.

They can also make available to you, on free loan, several films on the uses of electricity in Industry — produced by the Electrical Development Association.

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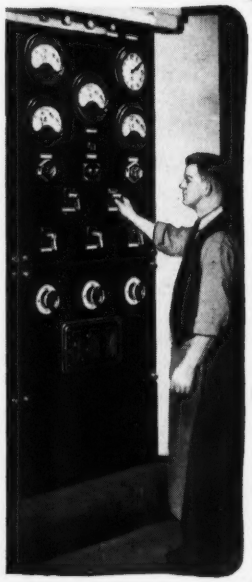
Steel - exactly!

The hand is on a lever, a small lever that is light to operate. But through that lever the hand is controlling the powerful current necessary to melt 20 tons of steel in an electric furnace. And because the furnace is electric the hand is doing much more than that. It is controlling the making of steel quickly, economically, exactly. Whether it be for production of exact-analysis steel or of cast iron from the lowest grade of scrap, there is nothing to beat the electric furnace. But the electric furnace is

only one of the aids to higher Productivity that Electricity can bring you.



Electricity a Power of Good for PRODUCTIVITY

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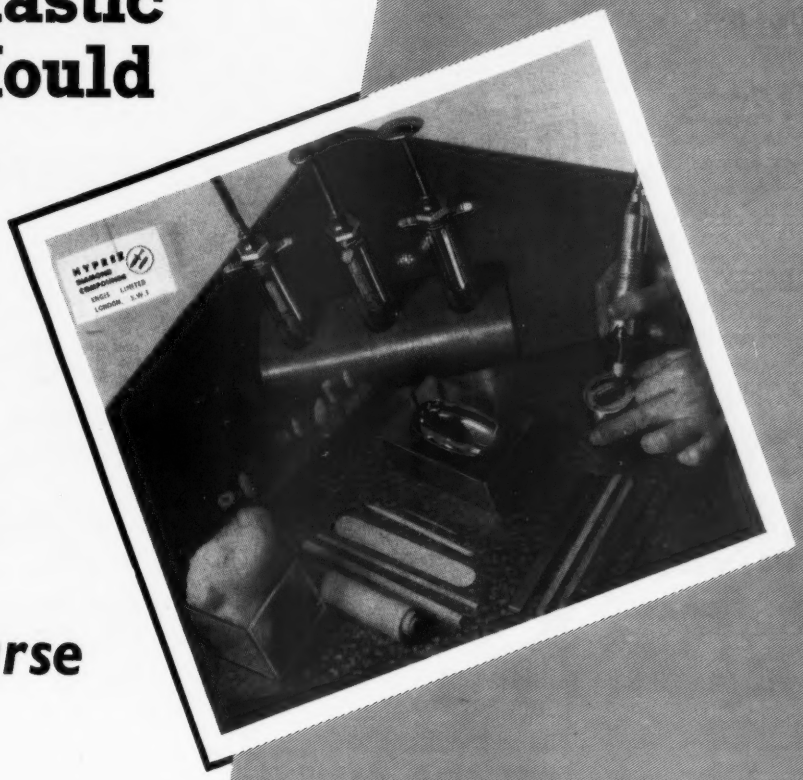

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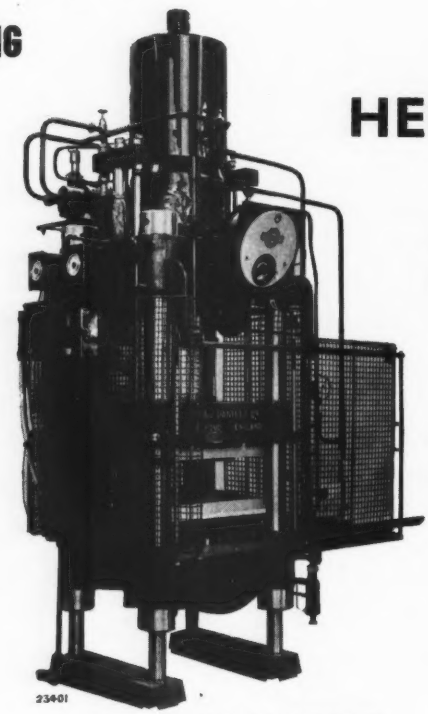

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1½ oz. SEMI- or FULLY-AUTOMATIC MACHINES

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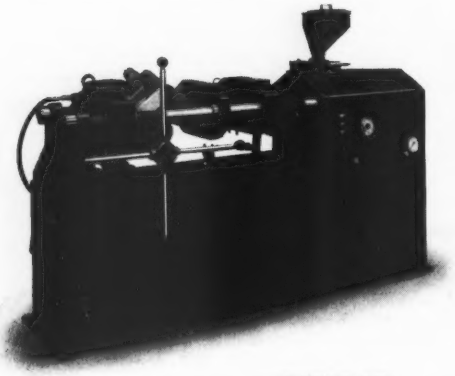

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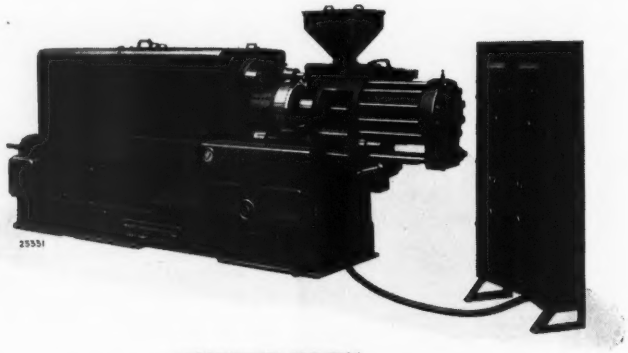

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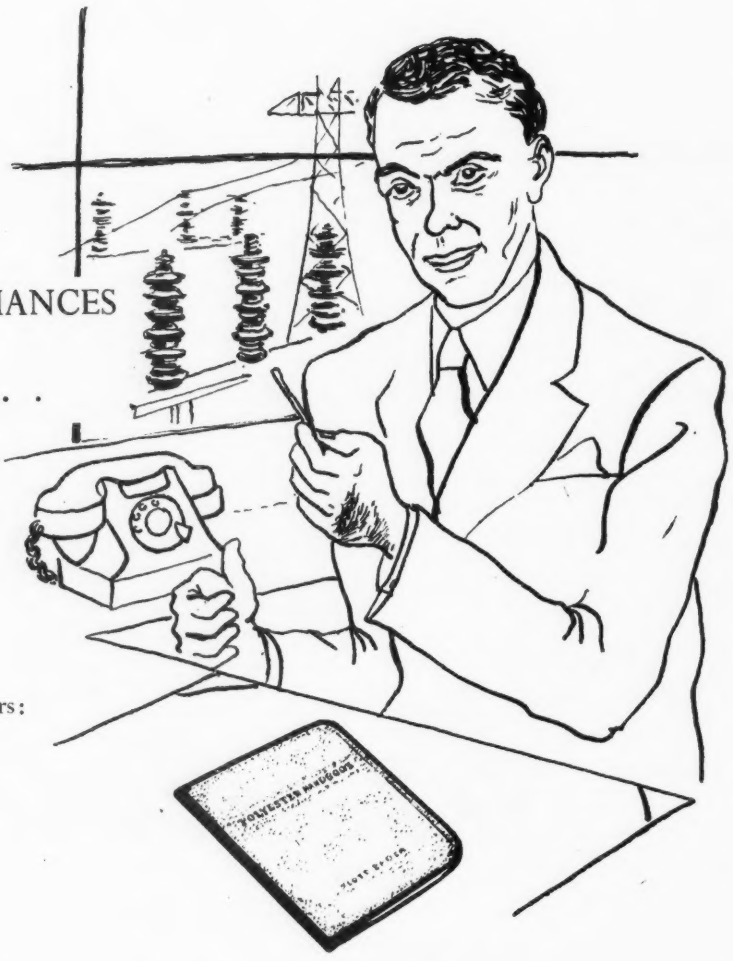

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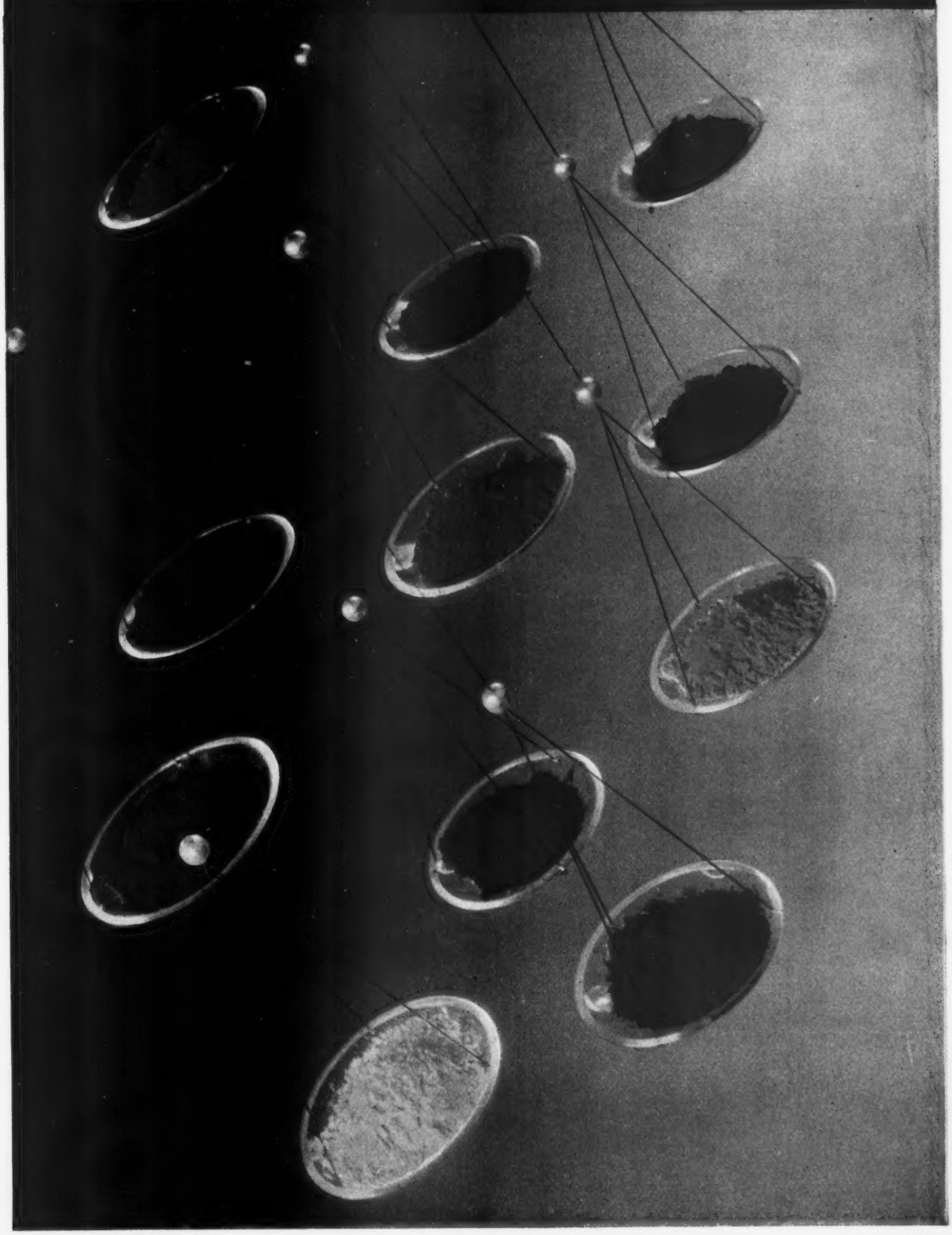

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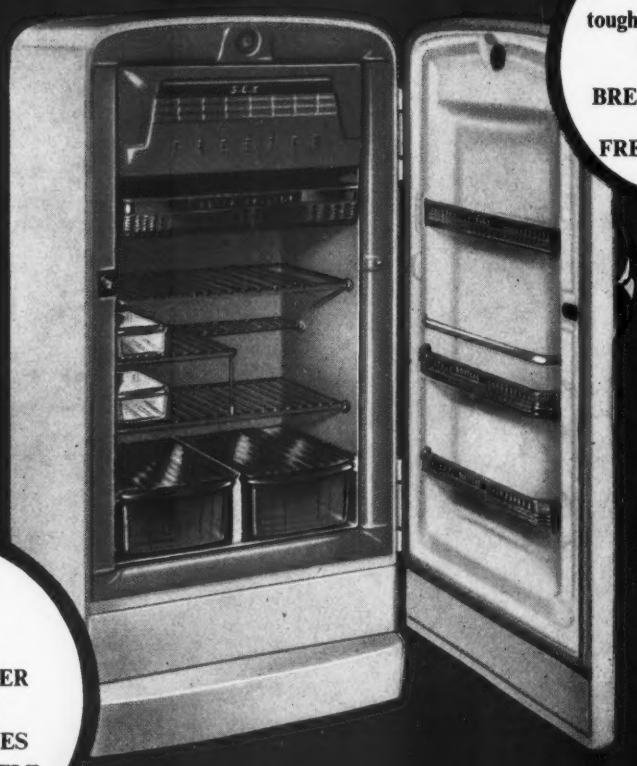
Erinoid polystyrene

for G.E.C.



CP.20 grade
toughened polystyrene copolymer for the BREAKER FRAME and FREEZER DOOR

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polystyrene for the QUICK CHILLER SALADORS BUTTER DISHES EGG AND BOTTLE SHELVES

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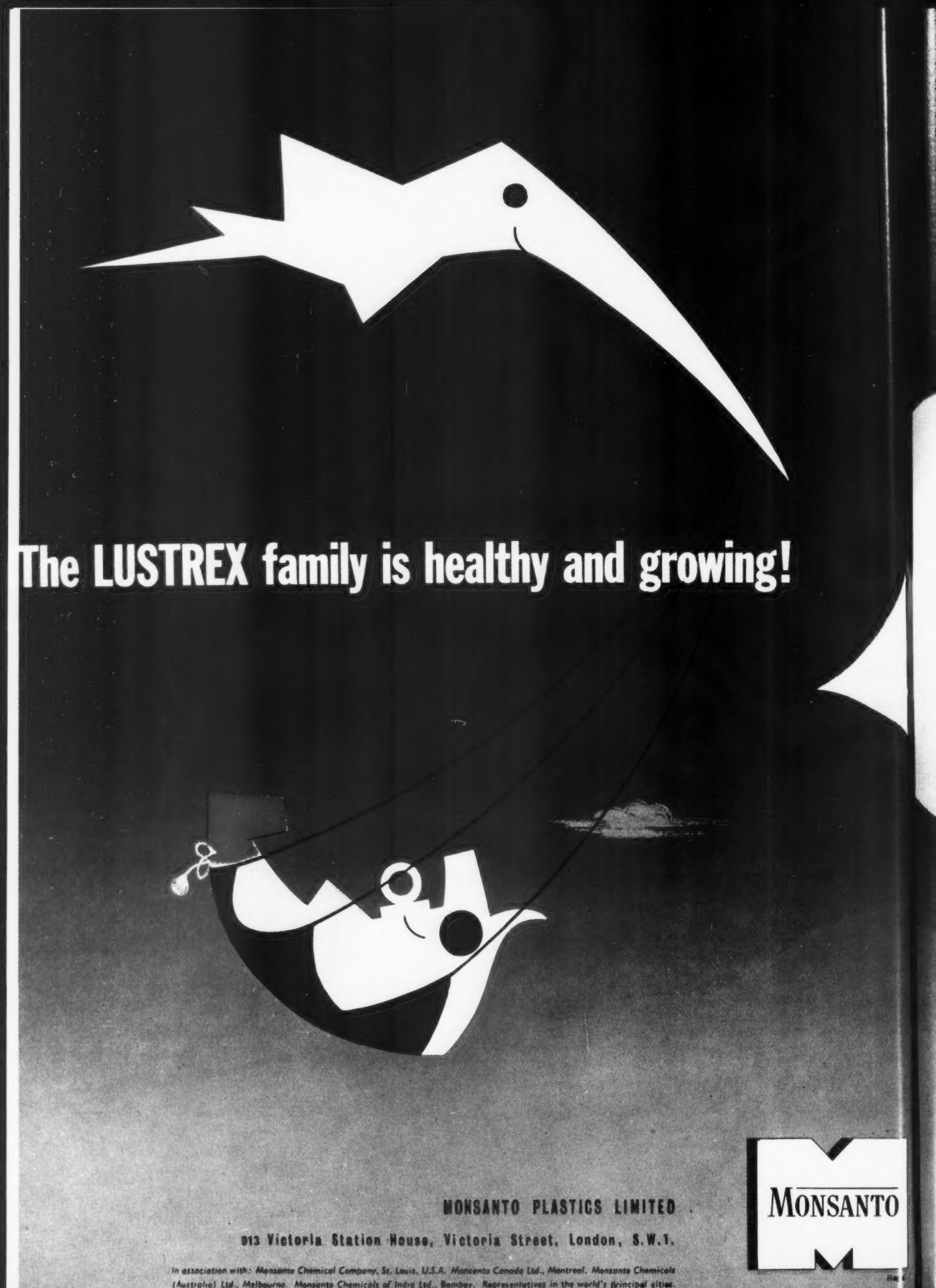
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'NESTORITE'

GRADE: Wood-filled Urea W.41

Filler	Woodflour
Particle Size (inches)	3/32, 1/8, 3/16 as ordered
Specific Gravity	1.45–1.65 according to colour
Bulk Factor (BS. 771)	2.5–3.3
Powder Density (BS. 771)	0.50–0.65
Time of Cure of Test Cup (secs.) .158°C.	35–50
Recommended flow range (BS. 771) .153°C.	4–7
Shrinkage (thou./in.) (BS. 771) at 150°C.	7–9
Flowability (cm.) (10-tons on 28 gms. on flat disc)	17–20
Brinell Hardness	40–45
Impact Strength (ft./lb.) (BS. 1322)	0.20–0.27
Crossbreaking Strength (lb./sq. in.)	11,000–12,000
Tensile Strength (lb./sq. in.) (BS. 1322)	8,000–10,000
Water Absorption (BS. 1322) (mg.)	400–500
Dimensional Stability in water (thou. per in. of moulding) (7 days)	10
Dimensional Stability after heating (thou. per in. of moulding) (50°C.)	1.6–2.6
Plastic Yield Grading (°C.)	100
Blister Temperature (50°C. per hr. rise)	140–160
Electric Strength at 90°C. minute value (V/mil.)	75–100
Surface Resistivity after immersion (log 10 ohms.)	10–11
Volume Resistivity (as moulded) (log 10 ohm. cm.)	10–12

Available in opaque colours and mottles, showing good light-resistance but less heat- and water-resistance than phenolics. Tools should be chromium plated and mouldings of thick section may be cured for 10 mins. at 125°C.; mouldings of medium section for 3 mins. at 140°C. and mouldings of thin section for 1 min. or less at 160°C. Slight modifications are available to meet specific moulding conditions or applications.

How 'Nestorite' fixed the fading Chameleon

So adroit was Charlemagne, the quick-change Chameleon, that he could fade into his background with the competence of a pickpocket at a Cup Final.

One day, when hotly pursued by that eminent Chameleonologist Lambert D. Kreppitt, he erred by crossing a Columnist in one of the left-wing Sunday newspapers which some litter-bug had discarded.

Desperately, Charlemagne endeavoured to turn his coat a shade of pink to match his surroundings. But Lambert, seizing his opportunity—and his catapult—let fly a shot of 'NESTORITE' Wood-filled Urea, thus preventing Charlemagne from fading further.

Instantly, the chameleon was exposed . . . for 'though he tried to change colour his 'NESTORITE' coating held fast. In a matter of moments he was reposing in Lambert's portable pouch.

In addition to small-size tablets for chameleon hunting, we supply larger quantities of 'NESTORITE' Wood-filled Urea for those in the Industry who require a high-quality Light Resistant Plastic Moulding Powder free from colour fading.

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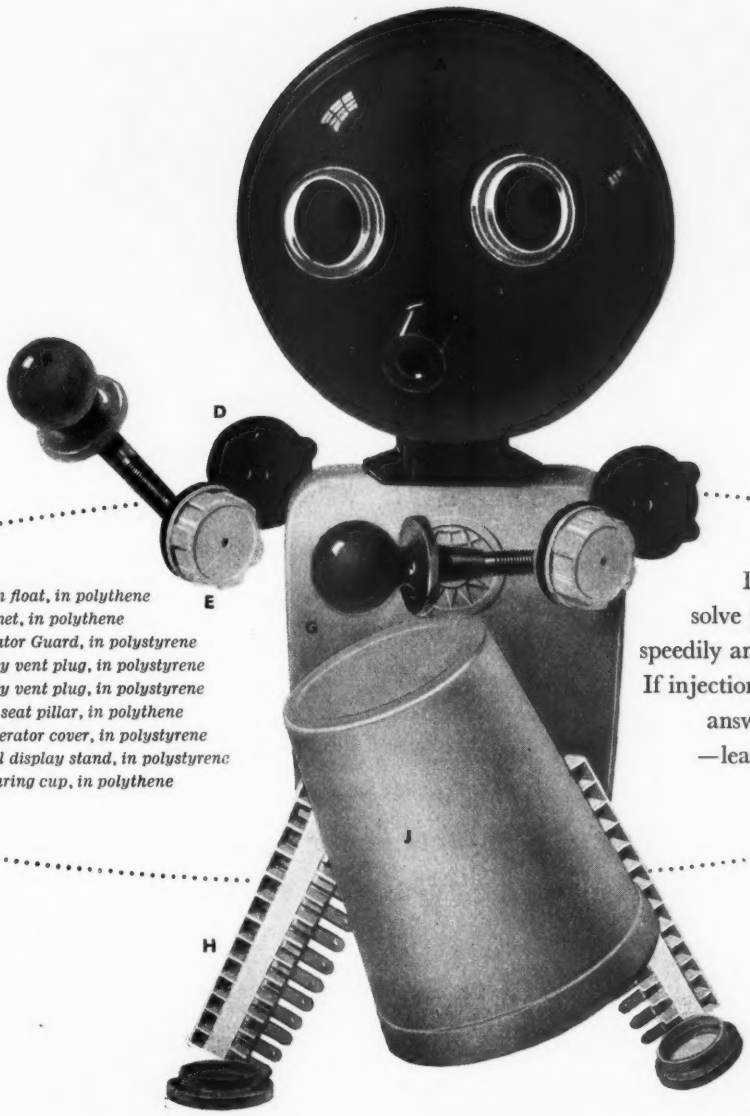
He's a big noise . . .

In fact, every bit of him is important. He's composed entirely of different injection mouldings—all of them produced for well-known manufacturers by the lively lads at Lorival.



A *Cistern float, in polythene*
B *Grommet, in polythene*
C *Separator Guard, in polystyrene*
D *Battery vent plug, in polystyrene*
E *Battery vent plug, in polystyrene*
F *Toilet seat pillar, in polythene*
G *Refrigerator cover, in polystyrene*
H *Dental display stand, in polystyrene*
J *Measuring cup, in polythene*

Lorival designers solve plastic problems speedily and economically. If injection mouldings can answer *your* problem —leave it to Lorival!

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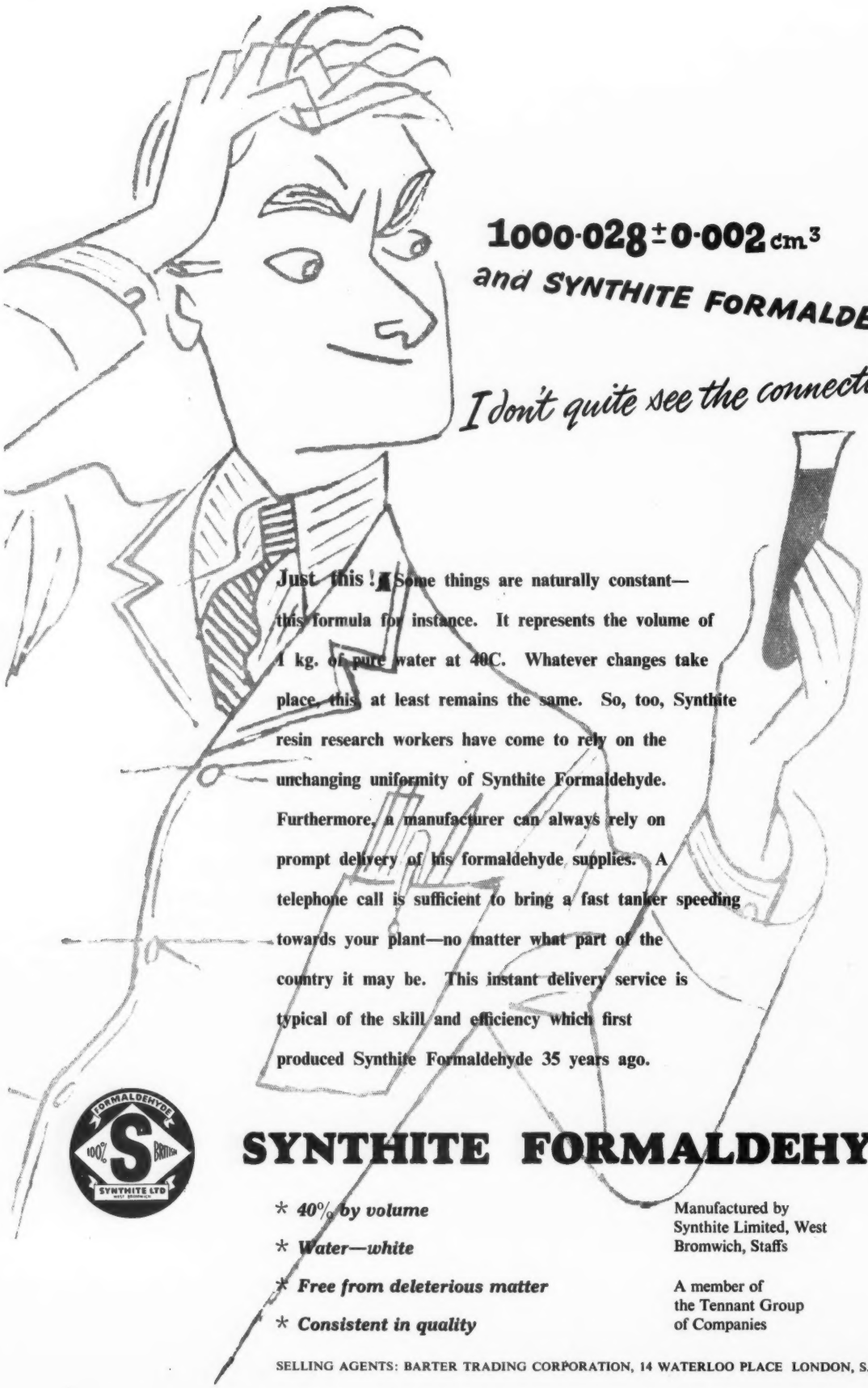

1000·028 ± 0·002 cm³

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I don't quite see the connection!

Just this! Some things are naturally constant—this formula for instance. It represents the volume of 1 kg. of pure water at 4°C. Whatever changes take place, this at least remains the same. So, too, Synthite resin research workers have come to rely on the unchanging uniformity of Synthite Formaldehyde. Furthermore, a manufacturer can always rely on prompt delivery of his formaldehyde supplies. A telephone call is sufficient to bring a fast tanker speeding towards your plant—no matter what part of the country it may be. This instant delivery service is typical of the skill and efficiency which first produced Synthite Formaldehyde 35 years ago.

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* *Water—white*

* *Free from deleterious matter*

* *Consistent in quality*

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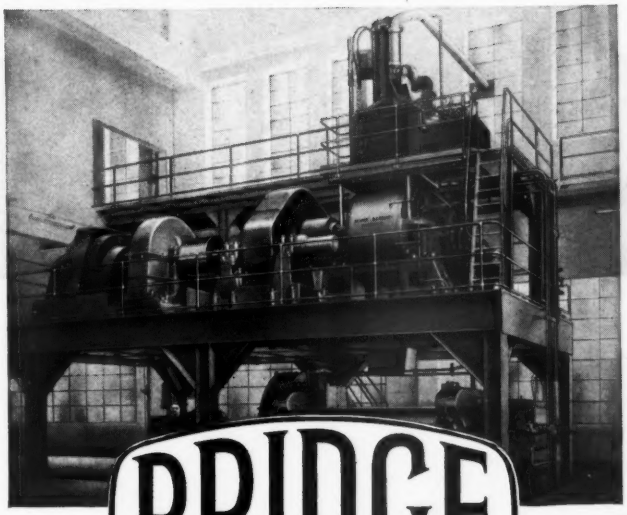

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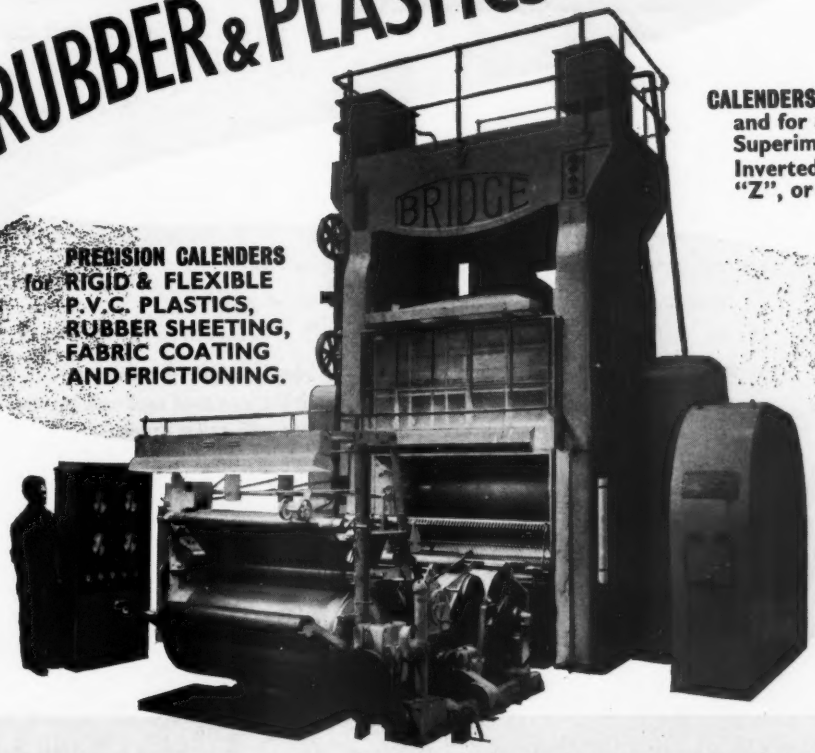

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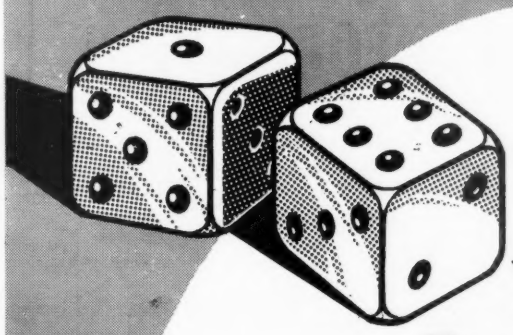
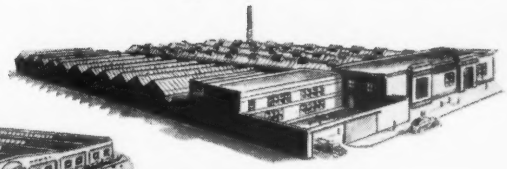
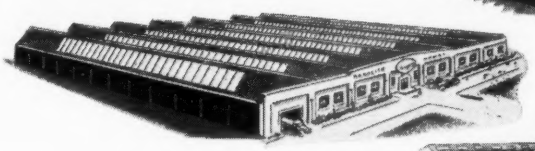


We didn't get here by chance!

Cheapside Works





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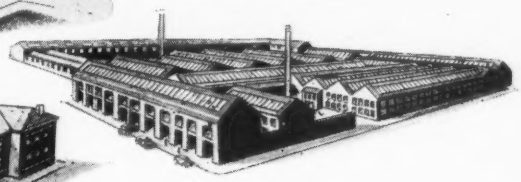
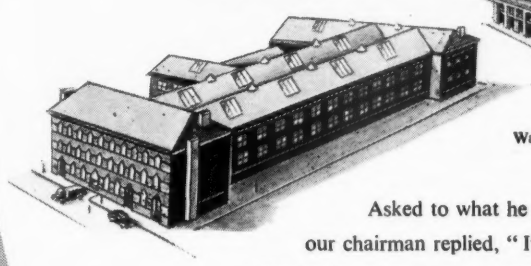
Victoria Works, Summer Lane





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Asked to what he attributed the success of the firm our chairman replied, "It is because we are engineers and understand our customers, most of whom are also engineers." That, in a nutshell, is the answer to all who have commented on the outstanding growth of the Company. From the humblest of beginnings in 1924—a single press and small boiler installed in a packing room—until today when four factories are required to house the most modern moulding plants, it is this appreciation of the needs of customers which has mainly been responsible for our growth.

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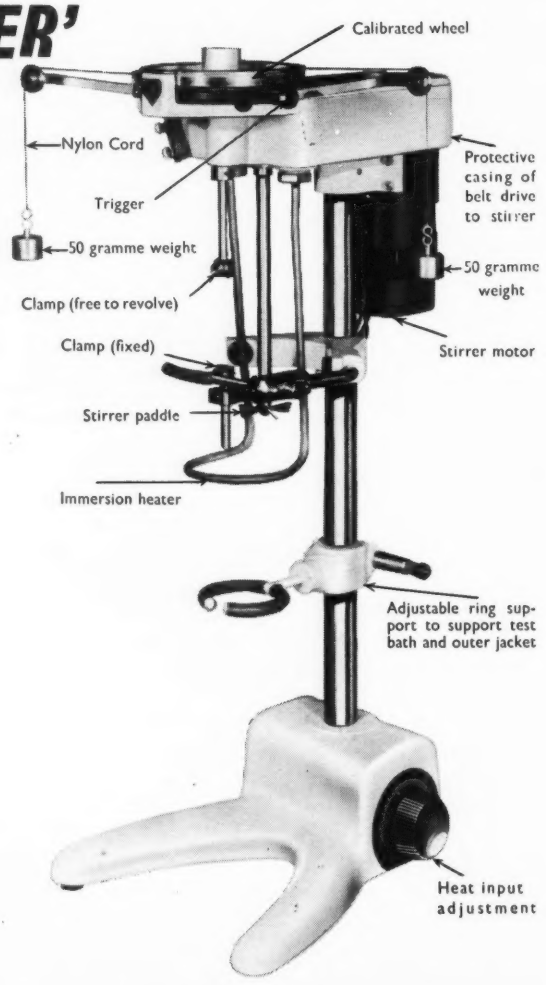
- The apparatus, originally designed by Clash & Berg of America, measures the angular rotation of a specimen, of standard dimensions, under a constant torque at temperatures between $-70°C$ and $+40°C$.
- The specimen, held in a clamp, the lower end of which is fixed and the upper end free to rotate under the application of constant torque, is immersed in a mixture of industrial spirit and solid CO_2.
- Torque is applied by two 50 g. weights, acting through nylon cords on a horizontal wheel, calibrated in degrees of arc.
- The wheel is released by a simple hand operated trigger, thus allowing the weights to exert the necessary torque. At the end of the stipulated 5 secs. period the trigger mechanism secures the wheel again and the degree of rotation can be read directly on the scale.
- A 500 watt immersion heater raises the temperature at a rate of approximately 2° C per minute. Heat input may be adjusted by the energy regulator on the base of the stand.
- The stirrer is operated by an encased belt drive from an offset motor to prevent the low temperatures harming motor or belt.
- Test bath and outer jacket are carried on an adjustable ring support, which may be lowered clear of the clamps for ease of assembly.



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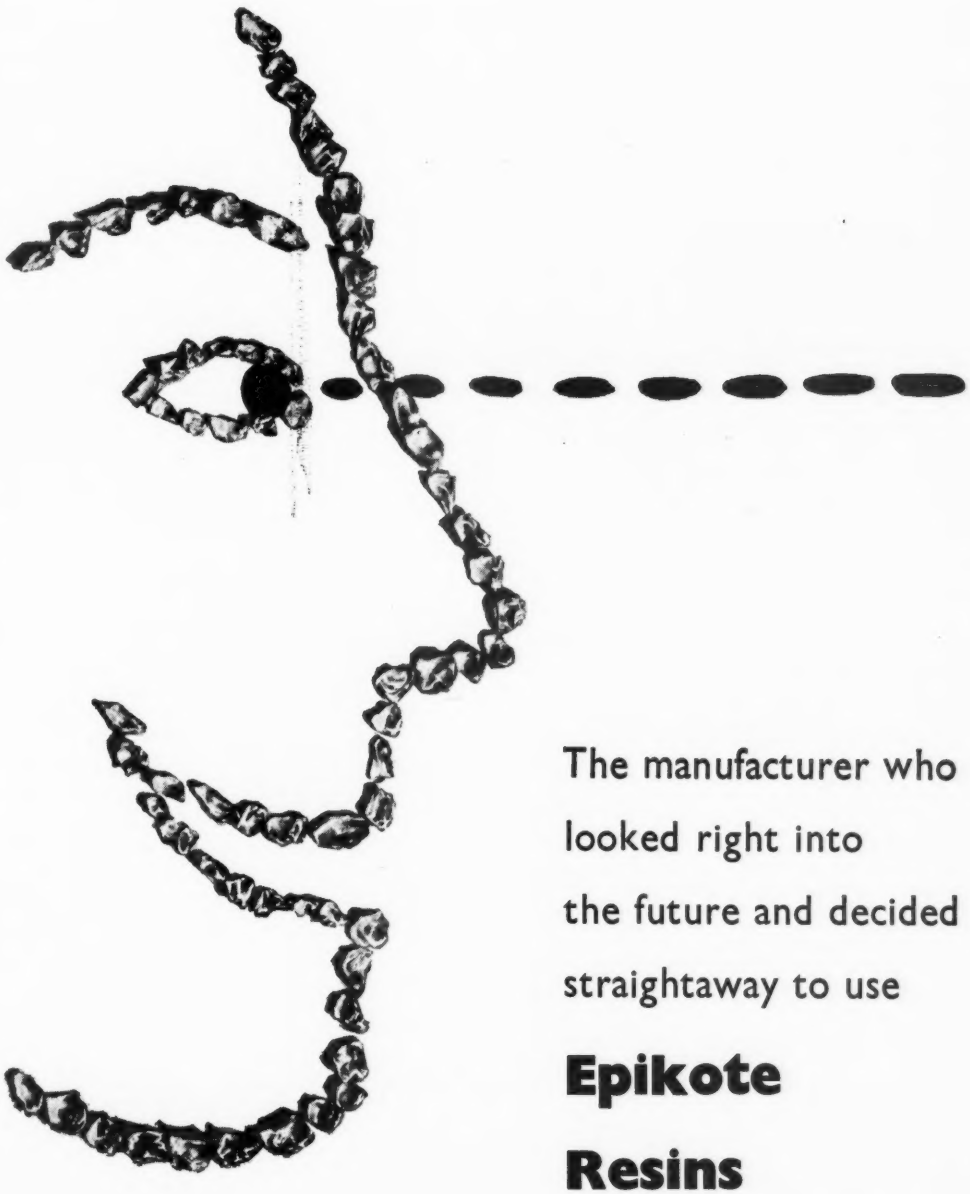

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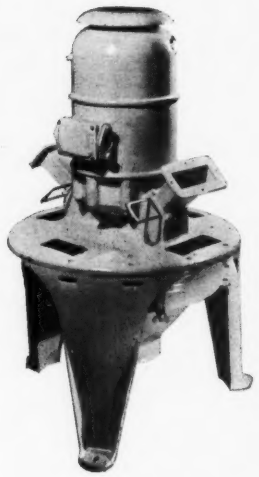

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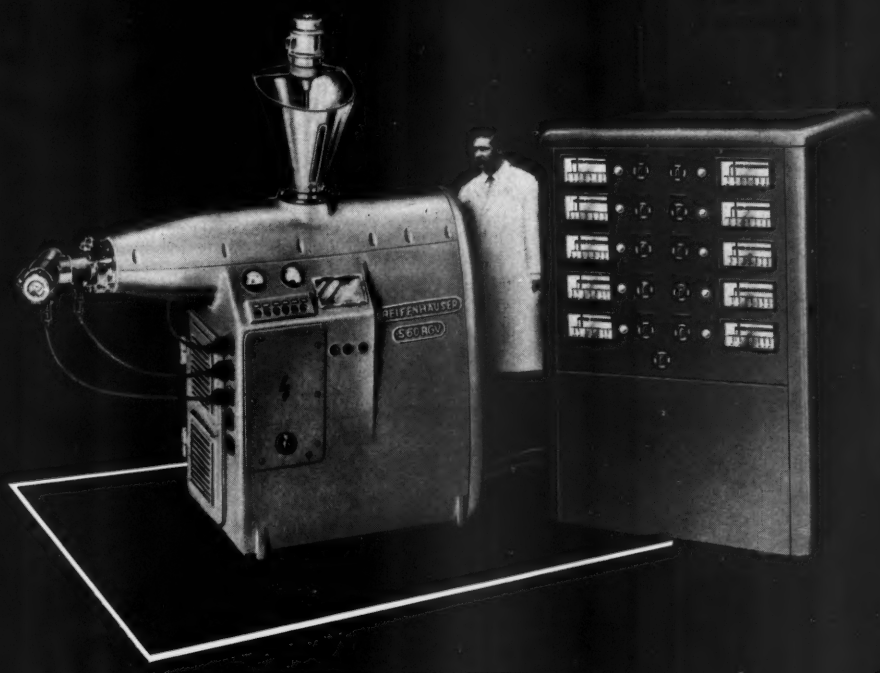

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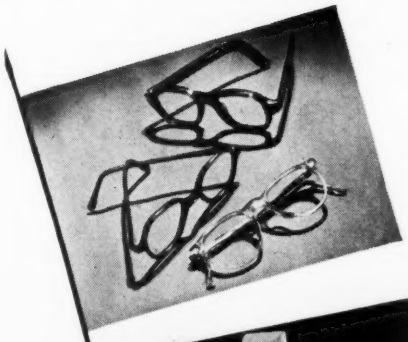

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for colour, clarity, sparkle & high polish

'Celastoid' Sheets are available in standard sheet sizes 49″ x 21″, 52″ x 24″, and 56″ x 25″ approximately, in thicknesses of 10/1000″ upwards. 'Celastoid' Sheets are washable, durable and can be supplied in several finishes—in clear transparent and in black, white and clear, translucent or opaque colours. Among the many uses for 'Celastoid' sheets are :—

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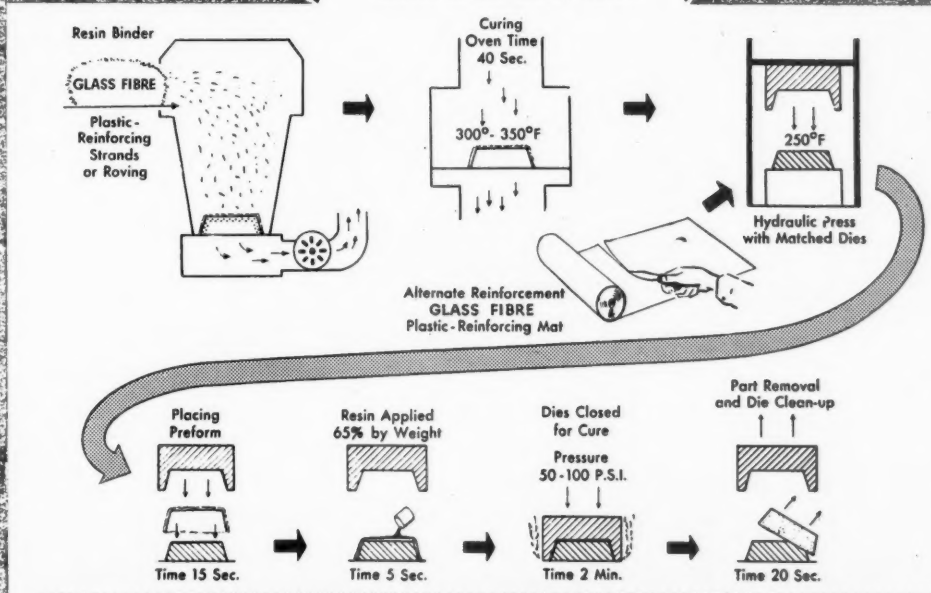

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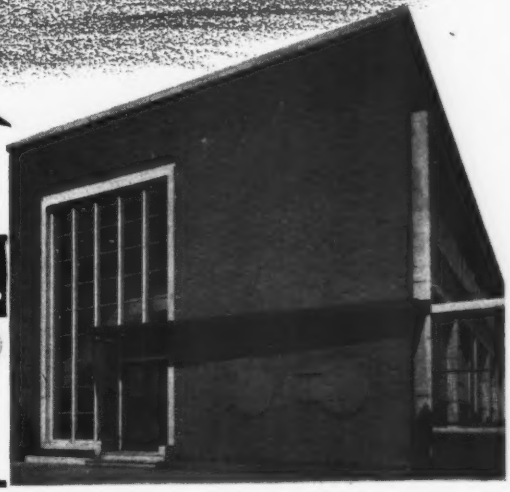

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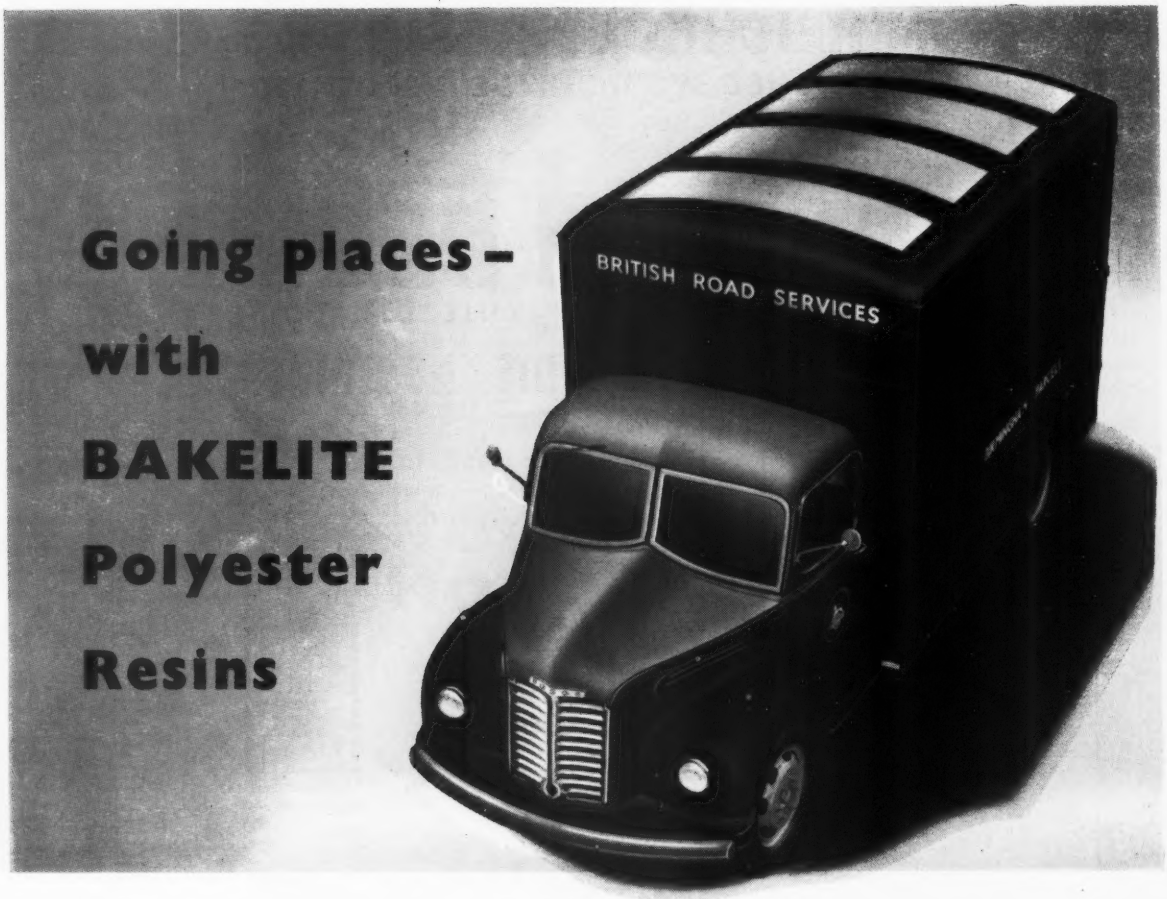

For this vehicle made to the order of British Road Services, much of the bodywork—including front wings, wheel arches and reinforced roof—was moulded from BAKELITE Polyester Resins reinforced with glass fibre. The translucent roof provides natural lighting for the interior, and is the first of its kind to be moulded entirely in one piece.

In one or another of their many forms, BAKELITE Polyester Resins are being used for an increasing number of applications, including complete car and motor vehicle bodies, boat hulls and special aircraft components. The following are among the grades available for glass fabric laminating, low pressure moulding and casting.

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SR. 17460 — A general purpose resin particularly suitable for hot moulding applications, e.g., pre-form moulding.

SR. 17497 and SR. 18893 — Light stabilised resins specifically designed for the production of translucent sheeting.

SR. 17438 — A resin used either by itself or as a modifier for other BAKELITE Polyester Resins to produce tough flexible castings, laminates or mouldings.

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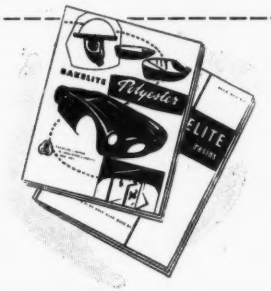
For YOUR information
Illustrated booklets describing the applications and advantages of using BAKELITE Polyester Resins will be sent on request.



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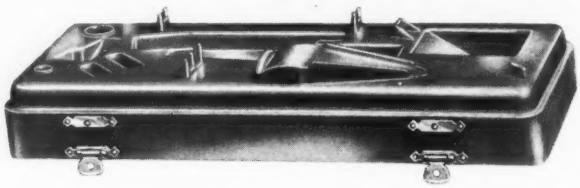

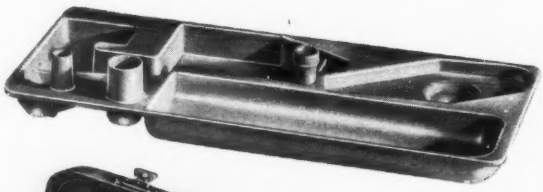

Illustrated is an instrument case in R.H.C. Polystyrene CP.20. Moulded by **Lustroid Ltd.**, Raynes Park, S.W.19, for **Keeler Optical Products Ltd.**, Windsor.

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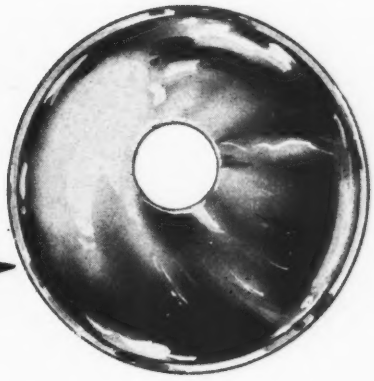

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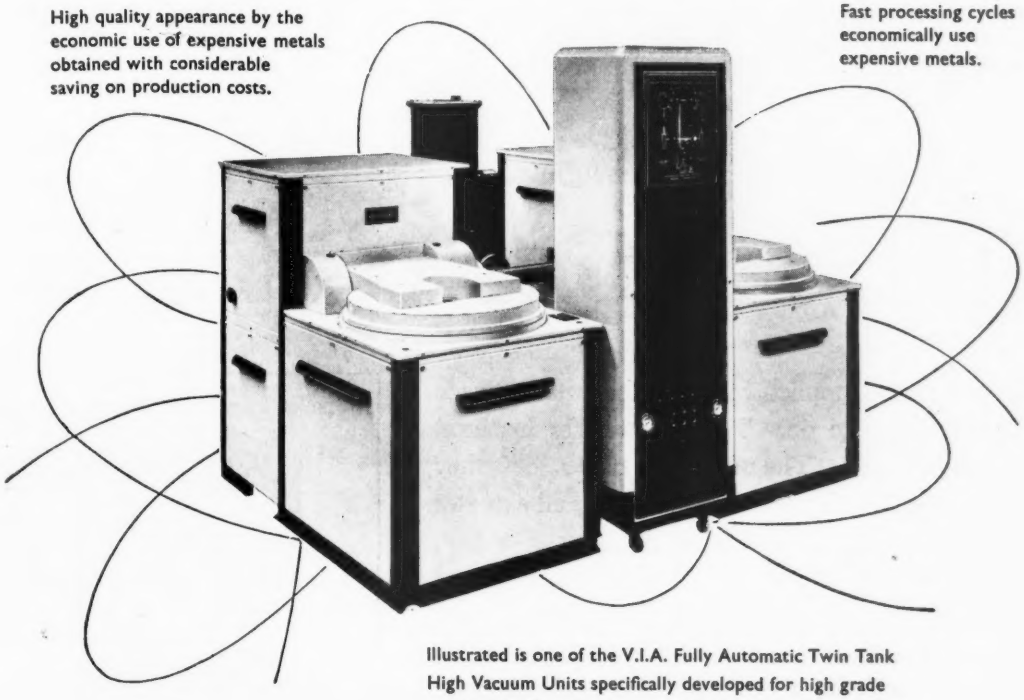

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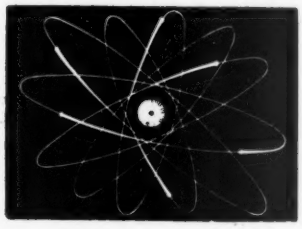

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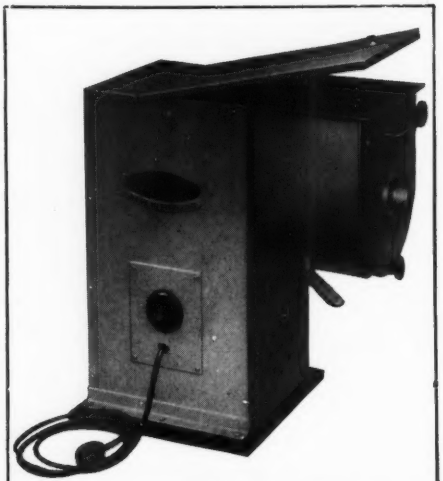

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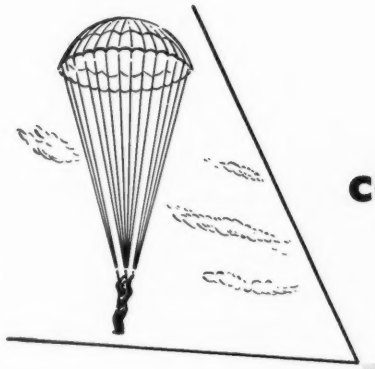

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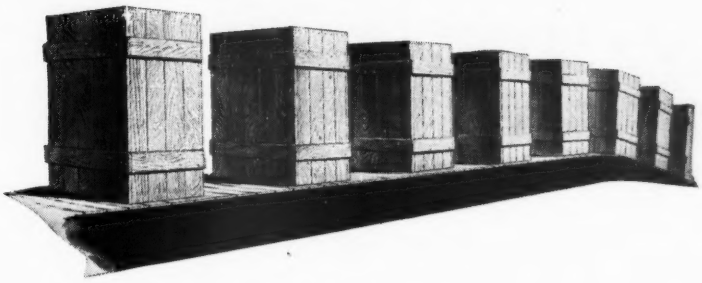

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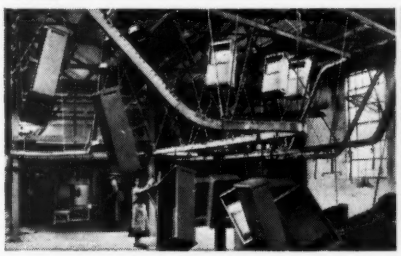

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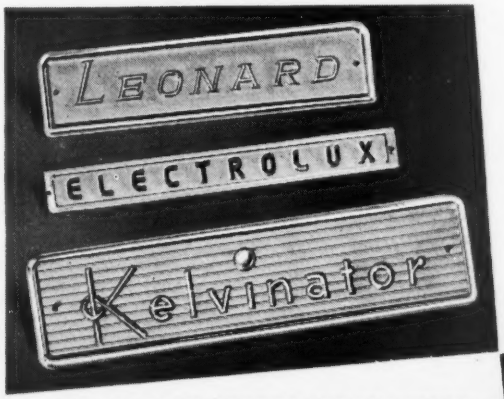

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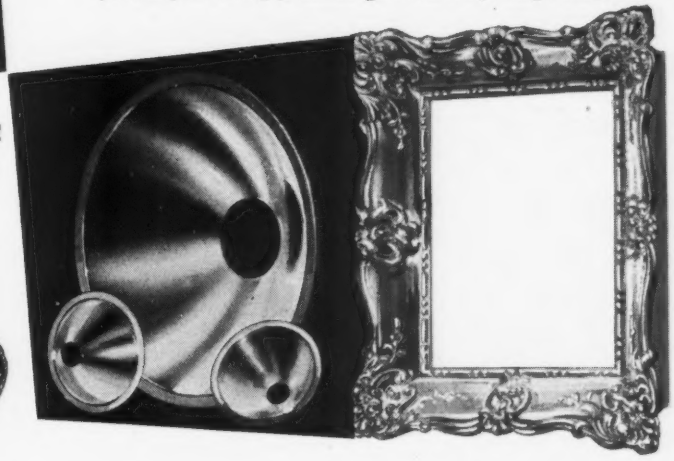

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Plastics

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CONTENTS

	Page
Editorials	99
Moulding Powder and Shot	100
Plastics in the "Valiant"	101
Extruded Acetate for Lampshades	102
The Moulding of Rigid Vinyl Sheet	104
Resin Bonded Veneer Applications	105
World's Industry Employs Plastics	107
Plastics in the Service of Man	108
Letters to the Editor	111
Fastening System Fabricated from Extruded Polythene and P.V.C.	112
The Production of Blown Plastics Articles, by H. Spies	114
New Productions	117
Plastics News	119
Talking Shop	123
The Properties and Testing of Plastics Materials—Part II, by A. E. Lever, A.I.R.I., and J. Rhys, M.Sc.	124
Modern Steels for Plastics Moulds and Hobs, by R. Groves	127
Patent Review	129

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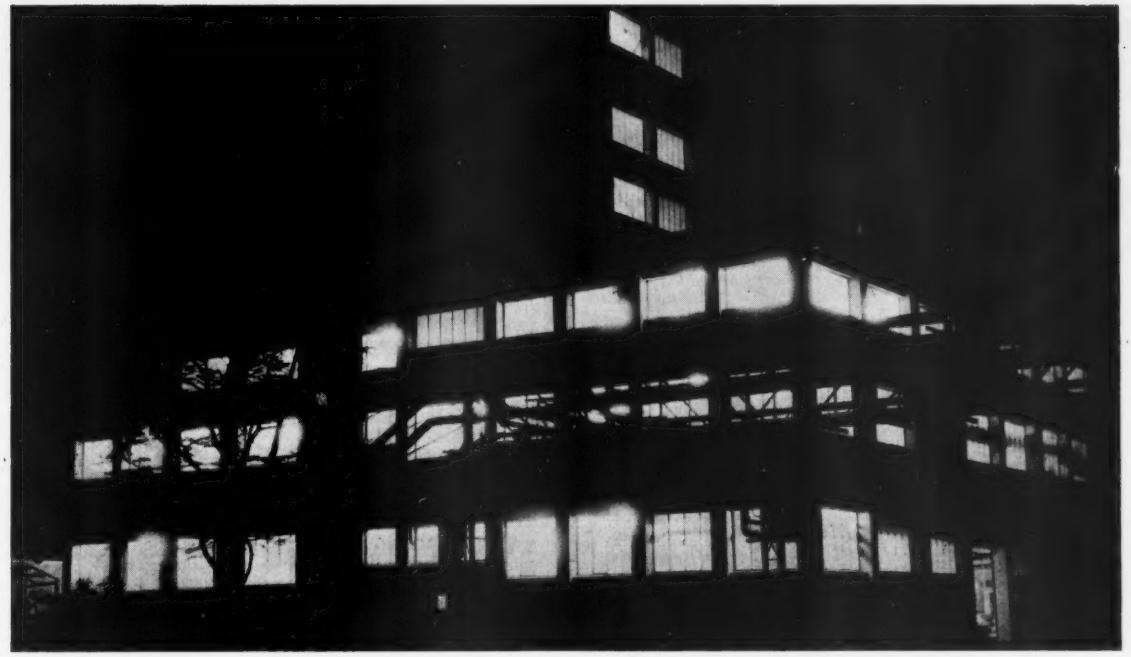

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Plastics

VOL. XX. No. 213 APRIL, 1955

EDITORIALS

Reinforced Structures

WHEN glass-fibre/polyester resin structures grew to industrial importance some five years ago, we remember commenting in the editorial columns of this journal on the creation by the American Society of the Plastics Industry of a special Reinforced Plastics Section, the definition of reinforced plastics being laid down to mean those made from polyester resins reinforced by glass-fibre, to the exclusion of all other composite or laminated structures. We regretted that such a deliberate segregation should be made even though it was clear that the strength of the new structures can approach the tensile strength of steel, nearer than any other plastic and, therefore, deserved to be in a category of their own. We believed that many other structures—phenolic, urea, melamine and epoxy and the new asbestos-phenolic laminates (the latter appear to be neglected in the U.S.A.) should have been included in the general classification, since the production methods are similar and since much could be learned by wider and parallel study.

It is quite true that glass-fibre/polyester structures can give very high tensile strength, surpassing that of most non-ferrous metals, but the structure must be built scientifically and correctly whatever the strength aimed at. Badly built their strength falls sharply, and other laminates can be stronger, and more than ever is it clear that the early propaganda to introduce these materials as being eminently suitable for use by the "amateur" (meaning handyman) has been misguided and often costly to the operator.

Furthermore, there are as yet no specifications for finished products, nor, indeed, great semblance to consistency of production. Thus simple sheets can rarely be guaranteed to contain closer limits than ±10% of resin (this is often a low figure), and analysis of the sheet cut into smaller sections can give results of resin content of even greater variation. The difficulties are especially and more obviously exemplified in structures such as corrugated sheeting, where the flow of resin results in thicker "valleys" at the expense of the "hills." It is pleasing to record that one company at least has overcome this problem, although the main one of even resin distribution remains exceptionally difficult.

On the general question of reinforced structures, while we believe that the glass-fibre/polyester structures will prove to be the best of all so far available plastic materials for the engineer, yet it seems also clear that other types will have their important uses, especially since industry is prepared to examine and use reinforcements that are high in cost so long as the desired results are achieved. Low cost asbestos-phenolic resin structures have found an important niche, and two famous aircraft companies are producing drop fuel tanks and other structures for high-speed aircraft from this type of material with exceptionally high strength and non-flammable properties. Moreover, we have little doubt that "Terylene" with a tensile strength in the region of slightly more than half that of glass-fibre, and very high heat resistance should give interesting results (so long as monomers do not affect it), especially since we imagine that polyester resin should "wet" the synthetic fibre more readily than it does glass-fibre, giving greater penetration and, therefore, more even distribution.

Ageing of Structures

Another problem regarding these composite structures concerns their ageing properties which assume importance in proportion to the type of application. It is the first question put by an inquiring engineer—it was the first put to us by a motorcar manufacturer some two years ago. Frankly, we know less about the ageing of the resins themselves than we do about glass-fibre, which we presume does not age at all, and we have much to learn about the behaviour of the fibre embedded in resin under different conditions, so that the question cannot categorically be answered by laboratory tests —and each new application imposes new conditions and unknown factors.

In a vague way, but based on sound experience with other materials, we can be "certain" that low-stressed or completely static units will last "a very long time." In the case of a protective helmet we can be sure of its usefulness, for it is under stress, if we may put it so, at one instant of its life only. So that we can make a good attempt at a specification —its ability to withstand the blow of a given weight dropped from a given height.

On the other hand, the dropping of a brick on to a sheet of corrugated roofing as proof of its strength is interesting but cannot bear much relation to ageing or length of life for people do not normally drop bricks on roofing. Such a test tells us little, for the structure is under low stress. We should want to know if it retains its rigidity and condition through years of alternating rain, snow and frost.

A motorcar body must last for a number of years without serious deterioration, under continual and varied high stresses acting in different directions, but we cannot yet devise short-term tests to satisfy the motorcar engineer.

A glass fibre/resin tank would not worry us unduly, for, given adequate preliminary strength and the condition of straight-forward hydrostatic pressure, a long life could be expected, but a tube of the same material carrying liquid at high velocity might be subject to erosion and subsequent delamination.

Perhaps the only answer we can give at present for lack of knowledge is the practical one—to use the products and to watch results, in other words, the method employed by man throughout the ages with the materials he found to hand.

In the meantime the resins themselves are continually and closely under examination for improvement, quite apart from their actions and reactions to physical and other causes. For example, we have always been struck with the close resemblance between the catalytic cross-linking of polyesters with the method used for the hardening or "drying" of paint films—the method indeed used for very many years. The first employs styrene or a similar compound for the cross-link and oxygen (in the form of a peroxide) to initiate the cross-linking process, aided by an oil-soluble cobalt compound as accelerator. In paint formulation a cobalt compound is also added, but instead of using a peroxide, the cobalt is sufficiently powerful to absorb the oxygen of the air to do the work of cross-linking and the film hardens in from 4-12 hours.

Now it is dangerous to draw the analogy between polyester resin hardening and the drying of paints too closely, for there are differences between the two structures as well as similarities. But one point that should be noted is that the presence of oxygen in paint films, or rather the action it also performs in giving rise to certain undesirable compounds, is partly responsible for eventual deterioration which may be slow or rapid.

For this reason we hope for the discovery of other methods of catalysis. The use of ultra-violet light is already well known, and it may be that other sources of radiant energy can be employed to create free radicles to get the effects we want without the presence of oxygen or cobalt. We believe such a method would result in closer-knit structures of higher water resistance and improved electrical properties, all of which improve ageing qualities.

German Plastics Exhibition

ON March 23 we visited Düsseldorf to attend a press convention to discuss the plans for the German plastics exhibition to be held in October next. It was remarkable for its timing, more than six months prior to the opening of the exhibition which means that an extended and continuous propaganda will be maintained, for the lavish reception arrangements extended to more than 100 members of the foreign press and for the news given regarding the present position of German research and production. The country, that is West Germany alone, has succeeded in increasing production from 23,000 tons in 1947 to 325,000 tons in 1954, which raises it to second place in the list of producing countries. Polymers alone amount to 148,000 tons.

The story of the German industry was excellently told by one of the principal speakers, Dr. Werner Kneip of Hoechst Farbwerke, who also gave a remarkable view of the impact of plastics on world affairs, past and present. We chatted with him at the end of the meeting and obtained the interesting information that the Hoechst organization is promoting the production of polythene by the new process discovered by Professor Ziegler of the Max Planck Institute for Coal Chemistry at Mulheim (Ruhr); it is carried out without the use of pressure whereas existing processes all employ high pressure. In answer to our question regarding the catalytic method employed he replied that it was carried out by a special catalyst, not oxygen. At present the process is in the pilot stage so that manufacture will begin in about two years. Some ten licences to manufacture have already been issued.

MOULDING POWDER AND SHOT

Three Hearty Cheers!

W. Charles Waghorne, F.P.I., has been elected President of the British Plastics Federation, an occasion which presents me with the opportunity of giving three hearty cheers, not only because to me he personifies much of the history of the plastic moulding industry, but also because his wisdom, his energy and his integrity have contributed so much to the present stature and strength of the Federation today and therefore to that of the whole industry itself. If you want another reason, it is a purely personal one. I first met him nearly 20 years ago when I wanted advice and help in the complex strange engineering world of moulding, of which I was largely ignorant. He gave me them without stint or reserve with the sole idea that the results might promote the welfare of the industry. Charles Waghorne entered it in 1906 so that next year he celebrates half-a-century's activity. He began

in Hunt and Hess, a company moulding bitumen and shellac compositions, and from which developed the well-known Litholite Insulators and St. Albans Mouldings Ltd. He worked under Mr. Hess, a German engineer and a pioneer in these early raw materials, serving successively as press and finishing operator, as foreman, mould-designer, and salesman and then as works manager while still in his early twenties, so that his experience bears the hall-mark of uniqueness. Thence, he joined Insulators Ltd. in 1929 and is a director of that company. In an official capacity he has served the industry equally well, for he was a founder member of both the Plastics Institute and of the British Plastics Federation, serving the latter as first Chairman in 1933 and again taking the Chair in 1946. He has also served on many occasions as Chairman of the Moulders Group and has been for some years a member of the Worshipful Company of Horners, serving on the adjudicating committee for the annual Horners' Award.

◆ ◆ ◆

Terylene takes a Bow

I went to the "Terylene" show opened on March 29 by Dr. Alexander Fleck, Chairman of I.C.I., and I was thrilled more than I have ever been, and I assure you it takes a lot to thrill your very old and experienced correspondent these days. I was excited at seeing the lovely ladies parading in three-piece suitings and other whatnots, at what the handsome, well-dressed man will wear in 1956 in the way of gents' natty trousering (50% "Terylene," 50% wool), and the curtaining I'm to have in my boudoir. But most of all I was thrilled by the passing thought that in this country where the cotton industry seems doomed to decline still further, "Terylene" production and that of future synthetic fibres may yet see a renaissance in our technical and economic status to a level even greater than that of fifty years ago. By the way, I think Dr. Fleck exaggerated frightfully when he announced that I.C.I.'s "Terylene" production in this country will soon be 22 million pounds a year. I have secret information that the figure is not more than 9821.4 tons.

◆ ◆ ◆

Laminated Fuel Hods

I must make an important correction regarding the coal bins or hods made by William Mallinson and Sons (Mfg.) Co., Ltd., and which I described in our March issue. I stated that the new "conical" type to be launched (it is now in fact on the market) would have a metal lip to strengthen the leading edge against erosion. This, in fact, is not so for a very good and illuminating reason. Prolonged and exhaustive tests have revealed that the unprotected wooden lip was itself found to be the most durable of all. Metal edging strips were experimented with but were found to stand up to the onerous job less well than the resin-bonded wood. This is an important piece of good news for many other workers in the plastics industry in similar fields.

DOGSBODDY.

Plastics in the Valiant

The increasing use of plastics in aircraft, particularly in service aircraft where standards of performance for materials are rigidly controlled, is amply illustrated by the Vickers-Valiant. Some of the components are shown here and represent only a few of the structural fabrications which are now an integral part of its construction. The electrical, control and hydraulic circuits also make use of the peculiar properties of plastics materials

2

1

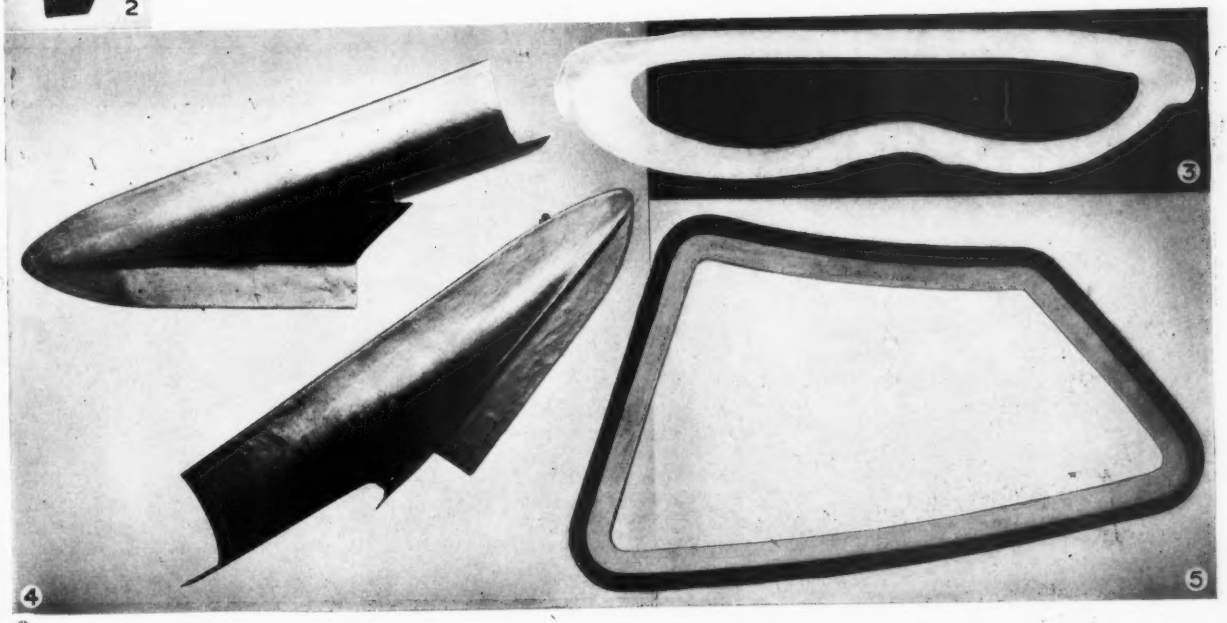
1.—The Vickers-Valiant Mk. I medium bomber coming in to land at Farnborough in 1952.

2.—The fin tip fabricated from glass cloth and Marco resin, supplied by Scott Bader & Co., Ltd., with Hycar packing, supplied by British Geon Ltd.

3.—The air intake made from glass cloth and tape laminated with Marco resin.

4.—T. E. fairing tips of resin/glass cloth laminate.

5.—Pilot's window made from Perspex bonded to a metal and rubber frame.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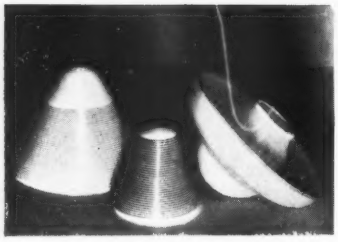


Fig. 1. Variety of Shape.

Extruded Acetate For Lampshades

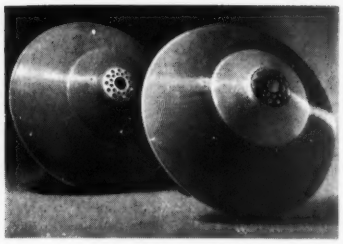


Fig. 2. Variety of Colour.

A novel method of manufacturing lampshades and similar articles has been developed by Rotaflex (Great Britain) Ltd. The method allows considerable flexibility in design, shape and colouring with economical production costs.

LIGHT fittings and in particular shades which are of a contemporary design have received universal acclaim. By careful choice of colouring, shape and without losing sight of their utilitarian purpose they have established themselves as an elegant accessory rather than a graceless necessity. It is, therefore, with a certain amount of pride we note the increasing use of plastics in their construction and the advantages which designers have enjoyed from their inherent qualities. It would be wrong to say that plastics have made these designs possible because both metal and glass are still used to a large extent. Plastics, whether they are in the group of thermosetting compounds such as melamine or urea, or in the thermoplastic group such as Perspex, acetate or polystyrene, have enabled a range of shades of brilliant colouring and pleasing form to be produced and sold within a price range which appeals to the average householder. This alone would be sufficient recommendation but with their other potentialities exploited to the full they will be, and are, materials that will find a ready application in this field. Their robustness and the ease with which they can be cleaned being two properties of no little importance to the housewife of today.

Various methods of fabrication have been adopted to produce the smooth contours and graceful curves of the modern designs, including moulding, forming and spraying but perhaps the simplest and yet the most ingenious is that adopted by Rotaflex (Great Britain), Ltd., of 25 Millbank, Westminster, London, S.W.1, some of whose shades can be seen in Figs. 1 and 2.

Production involves three primary operations, extruding, spinning and finishing and the bare bones of the process can be described by saying that acetate tube is spun round a mould and cemented. So simple and yet so effective!

Extrusion

Extrusion of the acetate tube is carried out on the premises. The machines used are special Rotaflex extruders. The screw is of a fixed pitch but the depth of the thread at the die head is reduced giving a smear working of the cellulose acetate. These extruders have been specially built for this particular job for their high speed. Production being at the rate of some 5,000 yd. an hour. Fig. 3 shows part of the extrusion shop with two of the nine extruders in use. The long take-off, the speed of which is governed by the screw speed, is necessary to ensure adequate air cooling of the tube prior to

Fig. 4. (Above) The diversity of size and shape which can be obtained is amply illustrated in this photograph. These shades have still to undergo the finishing operations.

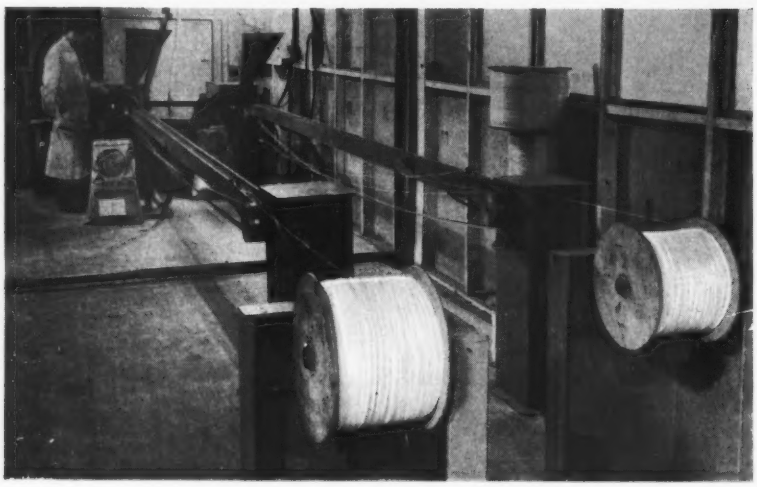


Fig. 3. (Left) Two of the special high-speed extruders used for producing the acetate tubing from which the lampshades are ultimately manufactured.

Fig. 5 (left) Finishing wastepaper baskets with extruded edging.

Fig. 6 (right) Candy-striped wastepaper basket.

winding, water cooling would have a detrimental effect on the cementing operations which are to follow. The raw material, a special grade of Erinoid cellulose acetate, is pre-heated and dried before use. The pre-heater is also coupled to the beginning of the take-off belt where it acts as a fume extractor and provides draught cooling. The diameter of the tube extruded varies according to the type of product required.

The edging or binding used in the finishing operation is also extruded on these machines.

Spinning

The second operation, the spinning of the tube on special moulds, is carried out by female operators working alongside a conveyor belt. The reels of extruded acetate are fitted to the end of the working bench and the tube fed over a pulley on a spring-balance gantry. This not only ensures a free feed of tube to the operator but also provides a cushioning effect when the reel becomes stuck. The mould is fitted to the spindle of the electrically driven spinner and two or three or more colours can be inserted at will and multiple winding carried on. The speed and general control of the machinery is effected by a foot-operated mechanism Some of the shades at this stage of manufacture are shown in Fig. 4 which also gives some idea of the diversity in shape and size which is obtained by this manufacturing technique.

Finishing

The finishing operation is simply the fitting and cementing of an extruded edging to the rims of the shades. In the photograph Fig. 5 this is being done to a wastepaper basket, the finished article being shown in Fig. 6, but the operation is similar for the light shades with the exception of the wire reinforcement which is not employed. In this case there is an additional operation in the cementing of an injection moulded base. Certain designs of shades have internal diffusers fitted but this presents no difficulties as the diffuser is made separately and cemented in afterwards.

The variety of designs produced come from many different sources. The Continent and in particular Denmark has been a fruitful supplier; customers have specified their own designs and others have been developed by the British Rotaflex staff designers. The combination of artistic colour matching and contrasting, with good design, has produced an attractive product which has rapidly become established and the company is now expanding overseas. Two new factories are being opened in Belgium and France and one is already operating in Italy.

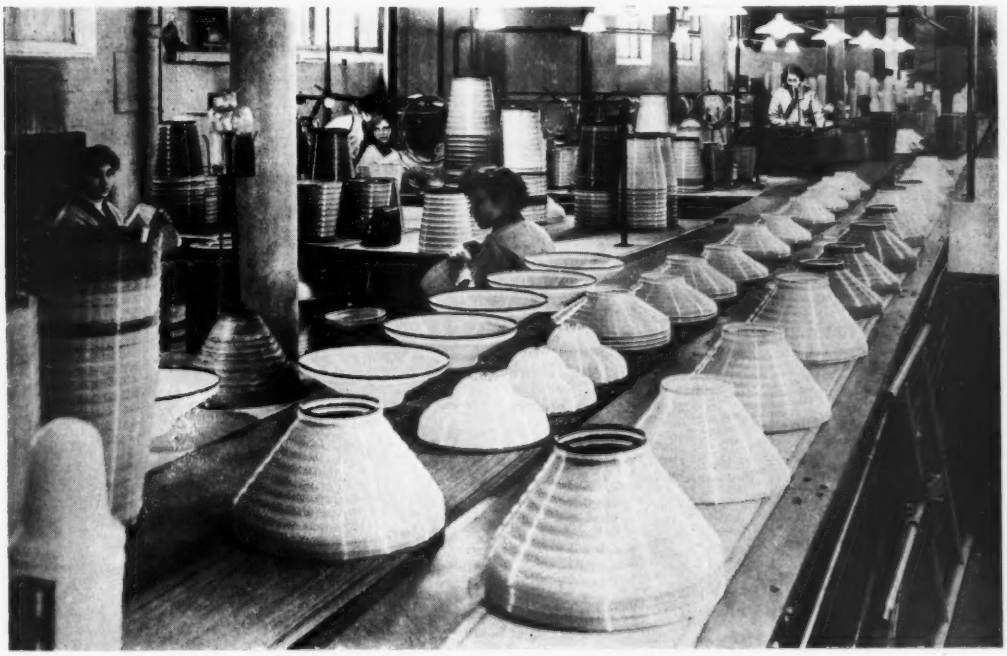
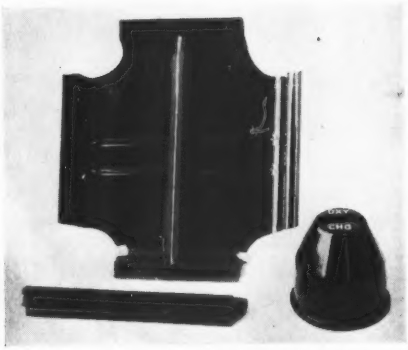


Fig. 7 The main conveyor line showing finishing operations being carried out and completed lamp-shades ready for packing.



The Moulding of Rigid Vinyl Sheet

The strength and chemical resistance of rigid vinyl sheet are two of the properties which would help to account for the popularity of this material. But the ease with which it can be formed is an equally important asset.

Fig. 1. Battery case lid and a cover formed from rigid vinyl sheet material.

ONE of the more recent plastics sheet materials now becoming popular is of the rigid vinyl type. It has several properties which appeal to users and give it a wide range of profitable applications. Tensile strength 7,000 lb./sq. in. Volume resistivity 10^{15} ohms cm. and gives resistance to most chemicals, including mineral acids and alkalis. BX Plastics, Ltd., in their Cobex sheet have already found many useful and varied applications, some of which are described here.

The fabrication and moulding of the following articles are being carried out by Halex in their factory at Highams Park, London, E.4, where these photographs were taken.

Applications in Aircraft

In Figure 1 can be seen aircraft components for the Hawker Hunter fighter, the one on the left being a battery case lid and the one on the right a cover used in the oxygen equipment. The fabrication of these units is simple and requires no expensive equipment or moulds, an important item when very short runs are required. The battery case lid is formed by a simple punch and die mould made from wood. No sharp corners are called for although these could be incorporated if it were necessary. The $\frac{1}{8}$-in. sheet Cobex is heated on a platen until it becomes pliable, the temperature being in the region of 105° C. The sheet is clamped over the female portion of the mould by means of a metal retaining ring and quick-acting toggle clamps. The male former is then lowered into the sheet and held there during cooling, thus forming the article to the required shape which it retains after cooling. The component is trimmed and the corners cut out by a band saw and the additional bar, which is also formed to a V section by this method, cemented into position.

The cover is moulded in a similar way. In this case the draw is deeper and the corners more sharply defined, but this does not appreciably alter any of the operations except a slight increase in final pressure when moulding.

The moulding pressures are in both cases low and moulding could be done on hand presses or alternatively on a hydraulic press, always bearing in mind the limitations imposed by depth of draw, and moulded area. Figure 2 shows the mould used for the forming of the battery case lid.

Chemical Tanks

To illustrate the extensibility of this sheeting Figure 3 shows a chemical bath, the dimensions of which are 27 in. by 19½ in. with a depth of 12 in. This, unlike the aircraft mouldings and because of its simplicity of shape, does not require a female mould. The material is $\frac{3}{16}$ in. thick and the moulding technique is exactly the same as that used in the moulding of the battery case lid, the heated sheet, the clamping ring and the pneumatic forced tool all being essentials. It is notable that on a moulding of this depth there is no "local" thinning and the only signs of strain were on the lip of the bath adjacent to the clamping ring.

The ease of fabrication and depth of draw provide an excellent testimonial for the manipulation of this material which has already found a ready market in the vacuum-forming side of the industry where various types of package are being made from it. Also free blowing, blowing into a mould, and vacuum forming and shrinking back on to a male mould, are other methods of forming which are being successfully employed.

Rigid vinyl sheet is now standard equipment in the B.O.A.C. Viscounts for toilet fittings. It is also used in a similar capacity in the Dakota, York, Hermes, Constellation and Stratocruiser where it is proving more hygienic, economical and serviceable than its wooden and metal predecessors. In the domestic field, refrigerator door liners are being successfully formed from it and industrial applications include fume ducting and extraction fans.

Fig. 2. (Left) Forming battery case lids for the Hawker Hunter.

Fig. 3. (Right) A chemical tank moulded "free" showing the depth of draw obtained.

Resin Bonded Veneer Applications

Developments in the manipulation and use of synthetic resin bonded veneers have provided an extended field of application for this material. The fuel hod may well prove to be the forerunner of other new products based on this technique.

(Left) The Forming press with a stack of moulded channel sections.

THE connection between the plastics industry and the timber trade may at first glance appear to be rather slight, one link which springs to mind being wood flour, which has proved itself so valuable as a filler in the phenolic moulding powders. In return for this material, the plastics industry has produced a number of synthetic-resin adhesives, which have proved, under the most exacting conditions, to be superior to the animal and vegetable glues used hitherto.

The nature and extent of the use of synthetic resins by the woodworking industry may, perhaps, be restated here.

There are several types and formulations of synthetic-resin adhesives on the market today, and they can be divided into two groups, thermoplastic type and the thermosetting type. In the former classification come the polyvinyl derivatives (acetate, alcohol and butyrol), the polyacrylic and the polymethacrylic acid esters, and some of the cellulose and cellulose acetate compounds. In the latter group, phenol formaldehyde, urea formaldehyde, melamine formaldehyde, and the resorcinol cements and formulations of these are the principal resins. In the plywood trade, which consumes the largest proportion of these adhesives, the phenol and urea types are used most extensively, both having a high water resistance, the phenol formaldehyde being superior in this respect to the urea. Fire resistance, particularly of phenol-bonded plywood, is good, and in a serious fire which broke out in the Golden Gate Exposition at San Francisco it was agreed that the resin-bonded plywood walls were instrumental in preventing a greater spread. Urea formaldehyde resin has one notable advantage over phenol in its lighter shade of colouring. This becomes important when the adhesive is used with thin veneers where bleeding with subsequent staining may occur.

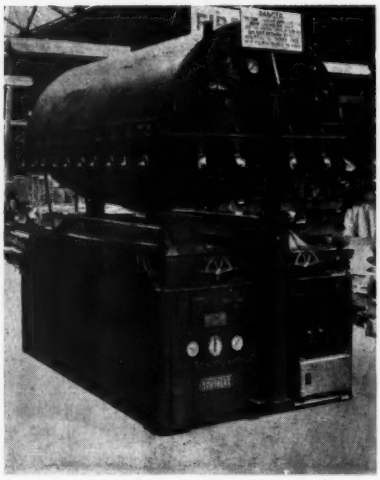
It must also not be forgotten that plastics materials offer the timber trade a unique opportunity to make better use of wood. By its construction, wood has its major shear strength across the grain, and its major tensile strength along its grain. By laminating, the grain direction can be crossed and a "balanced" structure achieved which gives high strength in all directions.

The history of the synthetic adhesives dates back to the 1914-1918 war, when the casein glues were developed. Early in the 1920s phenol formaldehyde resins were tried experimentally with considerable success, and it was from then onwards that the synthetic adhesives really became established. In the early 1930s, a German phenolic glue was developed which was so highly resistant to water that plywood bonded with it did not delaminate after several hours' boiling. The urea formaldehyde glues were developed late in the 1930s to provide a good adhesive which could be used in plywood manufacture, at lower pressures and temperatures than its phenolic counterpart. The use of plywood in the Mosquito aircraft, Army pontoons, motor launches and gliders is already well known and the vast quantities used gave a tremendous fillip to the synthetic-resin adhesive manufacturers.

From the war-time uses to a peace-time application is but a short step and the manufacture of the "Mallod Major" fuel hod, mention of which appeared in the March, 1955, issue of *Plastics*, page 68, serves as a good example of the use of synthetic-resin glues, as well as the interesting processes involved. The manufacturers, Wm. Mallinson and Sons (Manufacturing), Ltd., of Thames Road, Crayford, Kent, are well known as one of the leading companies in the plywood industry.

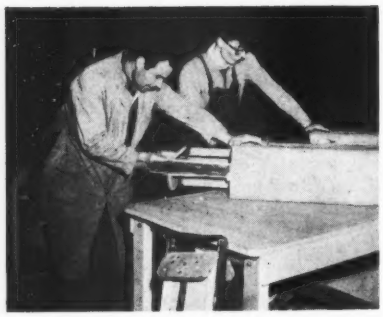
Materials

The "Mallod Major" is made from rotary or flat cut African hardwood veneers bonded with a fortified urea formaldehyde adhesive. Rotary cutting is carried out on a veneer lathe, where a trimmed log is rotated against a knife running the whole length of the wood. The veneer peels off in a continuous sheet until such time as the core of the log makes it impossible for further accurate and sound veneer to be cut.



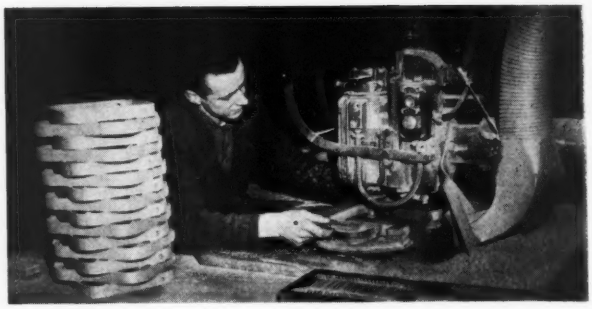
(Left) The Schubert press showing the moulds and the rubber sheet.

(Right) Machining the scarf prior to cementing.



(Left) Removing the formers after cementing the scarf.

(Right) Routing the inside of the lifting handle.



After cutting, the veneer is dried to a predetermined moisture content. In the case of the fuel hod, this is 10%.

Urea formaldehyde resin glues require a hardener to be added in order to set or solidify them. The type and quantity of this hardener controls the time required for the glue to set and consequent production rate; it also limits the pot life of the adhesive. Where short-cycle gluing is required, the resin can be spread on one veneer and the hardener on its facing veneer, thus rapid production is attained with no limiting pot life on the adhesive. However, a pot life of up to 24 hours with a setting time of 10 to 15 minutes can be easily attained as in this case when heat is used to accelerate the hardening, and by using a melamine hardener.

Manufacturing Processes

The first operation in the making of the main body of the hod is the laying-up of the veneers. The first veneer is spread with a layer of adhesive and a second veneer, having the grain running at right angles to it, is placed on top. The process is repeated until the required number of plys are obtained, in this case five. The sheet is placed on top of the mould inside a Schubert press.

The press head, as can be seen on the previous page, is semi-cylindrical in shape with a ¼-in.-thick rubber sheet across the underside. Inside the head are heaters thermostatically controlled at 190° F., the function of which is to accelerate the setting time. The lower platen of the press is perforated and connected to an evacuating pump

When the press head is lowered on to the mould the rubber sheet forms a seal from which all air is evacuated. Increased pressure up to 40 lb./sq. in. is obtained by pumping air into the head of the press. In this way the rubber forms the veneers round the mould, where it is held for 10-15 minutes until the resin is cured.

Having formed these channels, the next operation is the trimming of the edge and machining of the scarf for jointing. The taper on the scarf is 1 in 8, making a joint width of 1¼ in. Accurate machining is essential for good jointing. The joint is cemented and the two halves placed round a collapsible former. The sides adjacent to the joint are held to the former by clamps and the whole placed in a hydraulic press. When the joint is glued, the body is taken out of the press, the clamps removed and formers collapsed and withdrawn.

From now on the manufacturing processes are those generally employed in the woodworking industry. The body is cut to shape and the bottom squared off. The surface is smoothed down on a horizontal belt sanding machine and the holes for the handles drilled.

The top lifting handle is cut from a similar channel section to that from which the body is made up, the main difference being that it is 10-ply and not 5. The ends of the handle are rounded on a splindle and, to make it more comfortable to grip, the underneath of the handle is routed to a semi-circular cross-section. Incorporated in the design is a stop to limit the movement of the handle and thus prevent the user from trapping his or her fingers against the side of the hod. This is cut from the solid handle and it is a testimony to the material that such a projection, which will inevitably receive a considerable amount of shock, does not bruise or delaminate.

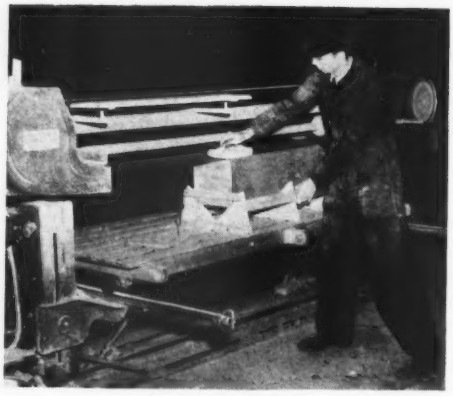
The smaller handle at the base is moulded to shape on a small hydraulic press and trimmed to the required size.

The base of the hod is cut from ½-in. ply rebated to enter the body.

In the final assembly operations the handles are riveted in position with special collared copper swivel pins. The external finish is sprayed either clear, revealing the natural wood figure, or darker stain. Internally, the hod is sprayed black.

One of the tests which a hod has undergone is that since February, 1954, it has been filled with water, and to date there is no sign of deterioration.

The design of the hod, which is registered and subject to patent application, was evolved by Mallinsons who, in applying their special technical knowledge, were assisted by the gas industry in producing an article expressly designed for beauty, strength and easy handling in the application of solid fuel, especially smokeless fuel, to open grates.



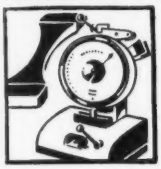
Sanding the body.

Riveting the handles in place.

The finished product.

World's Industry Employs Plastics

MATERIALS and TESTING



Plasticizer action.—The manufacture of hard plastics is sometimes difficult and a tougher material is obtained by adding organic liquids as plasticizers. As the action of the plasticizer is similar to that of changes in solidifying temperatures, it is convenient to study the plasticizer by its effects on solidifying properties.
(*Kunststoffe*, 1955/Jan./3.)

Stress-optical investigations.—The application of these investigations has been extended to the elasto-plastic field, as reported by R. Hiltscher. Therefore flow problems in metals and plastics can now be studied by using thermoplastic materials for making the models.
VDI-Zeits., 1955/Jan. 11/49.)

Urea-formaldehyde resins.—H. Fahrenhorst explains the chemistry of urea-formaldehyde resins by the ability of the relatively low-molecular compounds to associate with each other, which is specific to carbamide resins, and by the competitive linking of solvent molecules. The process leading to the formation of urea resins is neither true polycondensation nor true polymerization. Electron-theoretical notions are used for its chemical explanation.
(*Kunststoffe*, 1955/Feb./43.)

Flow properties of thermosetting plastics.—Discussion of main methods for standardizing the moulding properties of plastics. A new flow-test apparatus is described which can also be used for compounds of coarse structure. Said to be suitable for the original A.S.T.M. test for powdered compounds.
(*Kunststoffe*, 1955/Feb./48.)

Irradiated polyethylene.—Irradiation by electron bombardment converts the plastic from a thermoplastic to an infusible material which shows no stress-cracking. Solvent resistance is much improved at elevated temperatures and only slightly at room temperature.
(*Materials and Methods*, 1955/Feb./104.)

Three-dimensional stress optics.—New plastics on polyester basis permitted to carry out three-dimensional stress optical investigations on high-pressure pipelines.
(*VDI-Zeits*, 1955/Feb. 11/127.)

Foamed Isocyanates.—A versatile new plastic, has excellent thermal insulation properties, high strength combined with low density and resistance to moisture. Foams are available in two forms: (a) resilient to semi-rigid and rigid, (b) flexible, both in a wide range of densities.
(*Product Enginering*, 1955/Feb./140.)

Glass-in-plastic laminate is said to be uniform in properties and to eliminate the need for handwork in "lay-up" or production. It consists of one or more uncured sheets of plastics, each integrally reinforced with linearly aligned, continuous, closely spaced glass filaments.
(*Product Engineering*, 1955/Jan./211.)

Dielectric properties of plastics laminates.—Tests at BIT determined dissipation factor and dielectric constant over the frequency range 100 c/s to 10^4 Mc/s for temperatures up to 250° C.
(*Elect. Manufacturing*, 1954/Oct./95.)

Liquid neoprene coating is recommended for the protection of equipment and structures against splashing, fuming or spilling of acids, alkalis, etc. It is also effective where chipping and abrasion due to rough handling are problems.
(*Products Finishing*, 1955/Feb./84.)

New Polyester felt.—Dacron felt is said to be superior in strength, heat and chemical resistance to conventional wool felt. It has almost three times the breaking strength of wool felt.
(*Materials and Methods*, 1955/Feb./85.)

INDUSTRIAL APPLICATIONS

Plastics pipe.—Possibilities for future use were indicated by the purchase of polyester resin, glass fibre reinforced plastics pipe for the new Valley Steam generating plant by the City of Los Angeles. Smooth seamless interior of pipe discourages attachment of mineral and biological deposit usually found in pipe lines.
(*Mechanical Engineering*, 1954/Dec./1003.)

Reinforced-plastics truck-trailer.— 20% saving in weight and a gain of 150 cu. ft. of payload was achieved through use of reinforced plastics structural beams and panels on a refrigerated truck-trailer.
(*Mechanical Engineering*, 1954/Dec./1004.)

Plastics barge.—A flat-bottomed self-propelled plastics craft for shallow inland waterways overseas has been designed. It weighs only 10.2 tons and can carry 5 tons of dry cargo with a draft of only 21 in. when loaded; maximum load of 10 tons in deep water.
(*Mechanical Engineering*, 1954/Dec./1011.)

Plastics in building.—A conference on plastics in building was held in Washington, D.C., October 27-28, 1954, attended by more than 500 technologists, builders and architects. The objective was to give a true account of characteristics and potentialities of plastics in building.
(*A.S.T.M. Bulletin*, 1955/Jan./73.)

Miniature nylon bearings are supplied in straight sleeve or flanged shapes; the latter can take thrust loads and form a means of retention.
(*Machine Design*, 1955/Feb./243.)

Nylon-lined bearings are composed of a metal shell into which a lining or core of nylon about 0.005 in. thick is moulded and rigidly anchored. Close tolerances are held for bore, length, outside diameter and concentricity.
(*Machine Design*, 1955/Feb./260.)

Air-filter parts.—The weight of an electronic air filter has been reduced by the use of 60 nylon parts. At the same time the danger of breakage has been reduced. The filter operates at a 12,000-v. potential, the actual current flow is 20 milliamps. which chars other materials.
(*Materials and Methods*, 1955/Feb./89.)

Blasting of bonded plastics prior to low-pressure adhesive bonding was found to increase the ultimate shear strength by about 22%. A ferrous abrasive grit at 60 lb./sq. in. air pressure is used.
(*Materials and Methods*, 1955/Feb./103.)

PROCESSES : MACHINERY

Melamine - glass laminates.—A new technique of moulding melamine - glass mat laminates at low pressure between 150 to 200 lb./sq. in. has been developed. Examples produced are: a helmet and a clarinet case half. Properties for differently treated materials are given.
(*Materials and Methods*, 1955/Feb./94.)

New hardness testers.—P. Grodzinski describes the TNO instrument combining sensitive electrical depth measurement with optical measurement of indentation diagonal. The low-load hardness tester with increasing load, supplies a diagram of load over indentation depth and can be used for studying creep and recovery as shown on the example of polyamides.
(*Kunststoffe*, 1955/Feb./53.)

Vinyl base wrinkle finish.—A coating with a leathergrain texture is based on bakelite vinyl resins, said to have excellent abrasion resistance. A spray-on method has been developed to give durable finishes for business machine housings and interior panels of automobiles.
(*Products Finishing*, 1955/Jan./90.)

The hobbing method for producing dies.—The hobbing method for the production of series dies has the advantage of quicker and cheaper production compared with milling, in particular copy milling. The special problems to be considered are discussed by C. Oestman. A number of examples are shown.
(*Kunststoffe*, 1955/Feb./77.)

MISCELLANEOUS USES

International Conference Sweden.—The Swedish Plastics Associations (Svenska Plast Forewingen SPF) held an International Conference in Stockholm at which 500 experts were present. About 37 papers were read.
(*Kunststoffe*, 1955/Feb./59.)

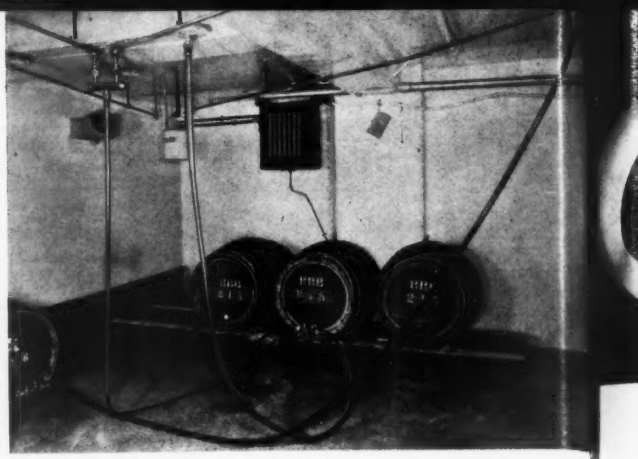
Plastics in lamps.—Plastics have found wide application in fittings for illuminating purposes. They are able to fulfil requirements as to low weight, high fracture strength and adaptability to modern design.
(*Kunststoffe*, 1955/Jan./13.)

PLASTICS
IN THE SERVICE OF MAN

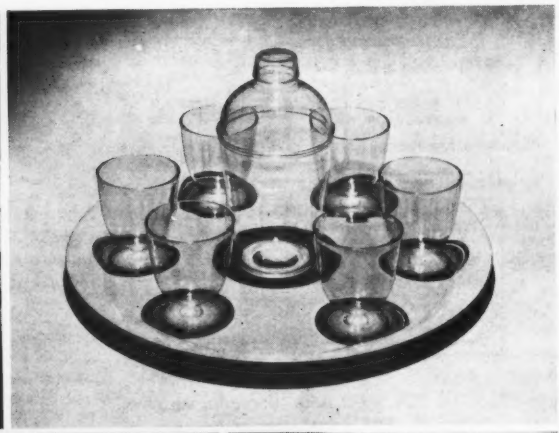
A pictorial review of high-quality units moulded or otherwise fabricated in Great Britain . . .

56. The Brewing and Distilling Industries - I

A list of trade-marks and companies mentioned in this review, with full names and addresses, appears on page 122



(Above) P.v.c. hose manufactured by BX Plastics Ltd., installed at the Queen of Hearts public house.



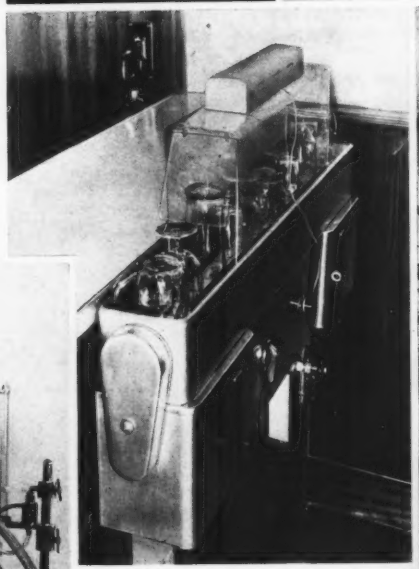
(Left) Set of glasses and cocktail shaker in acrylic manufactured by Runcolite Ltd., and designed by Gaby Schreiber.

(Left) Tray and ash-tray moulded by Ind Coope and Allsopp Ltd., in wood filled phenolic material.

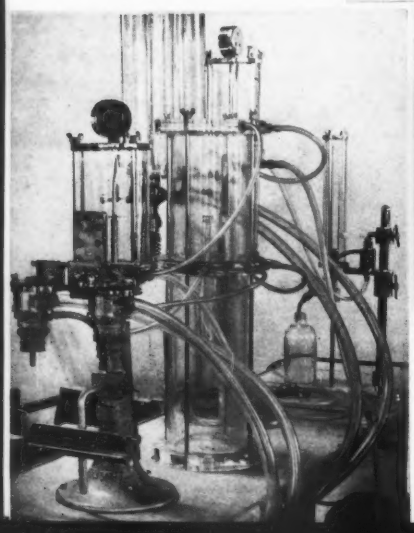
(Above) The "Yacht Club" bar with Formica panelling and counter top.

(Right) Polythene drip-catching bowl injection moulded by J. F. Kenure Ltd.

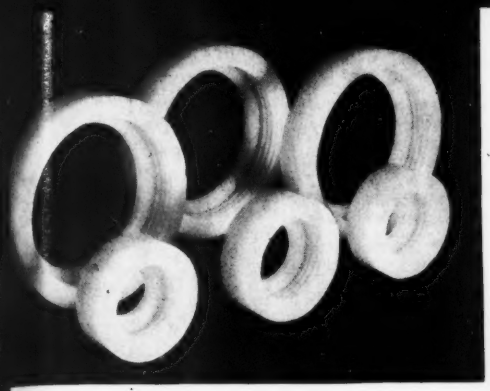
(Below) The cocktail bar surfaced with Warerite in the First Class observation lounge of R.M.S. "Queen Mary."



(Below) Bottle-filling machine manufactured by Gravfil Machines Ltd., incorporating BX acrylic and p.v.c. materials.



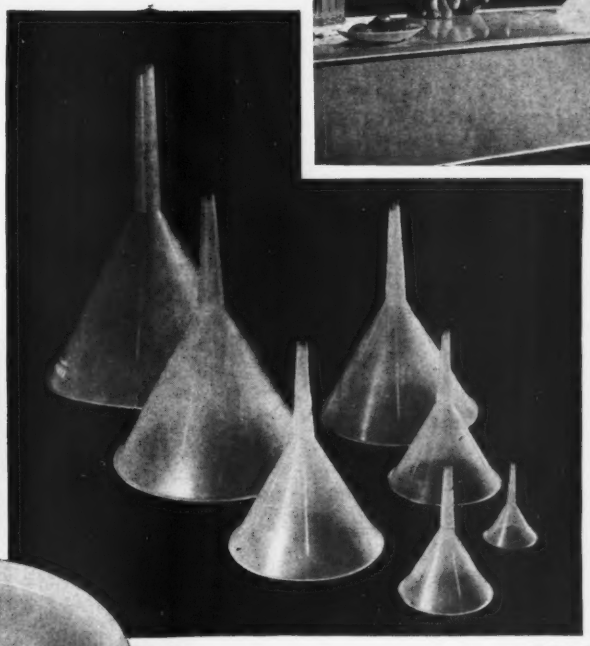
(Above) Hoover "Glass-master" with Perspex hood. (*Plastics*, 1952/Apr./105.)



(Above) Nylon pipe unions manufactured by British Rawhide Belting Co., Ltd., for the brewing industry. (*Plastics*, 1955/Feb./52.)

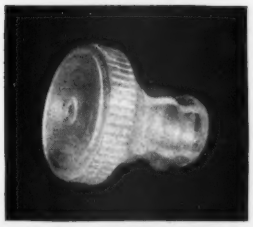
(Below) Waiter trays moulded in wood-filled urea by Universal Metal Products Ltd.

(Right) Formica cigarette-proof bar counter being tried out by burning spirit on it, at The Colony Restaurant, Berkeley Square.



(Left) A range of moulded polythene funnels produced by J. F. Kenure Ltd.

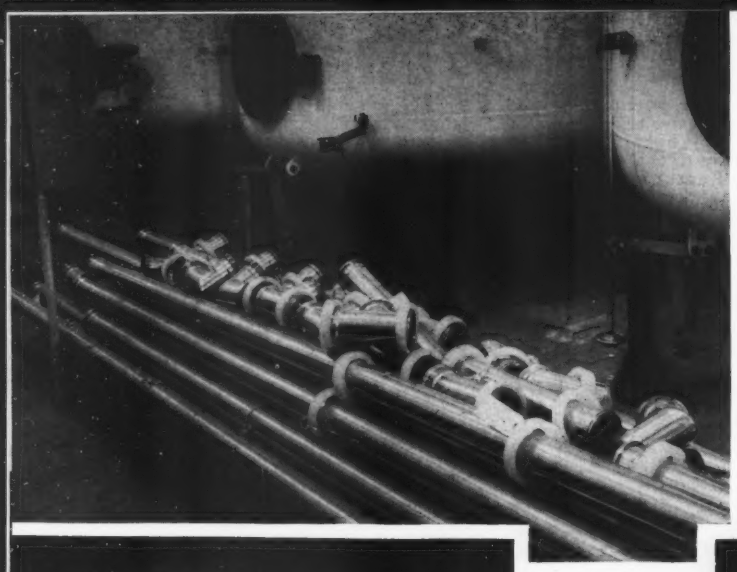
(Right) Specially designed polythene screw stopper to eliminate the use of a rubber seal moulded for J. C. Winterschladen, Esq., by Precision Products (Leeds) Ltd.



(Right) Cellulose acetate cockerel moulded by Crystalate Ltd., for Courage and Co., Ltd. The moulding, except for the base, has been metallized.

(Below) P.v.c. barrel cover manufactured and printed by Delmore Ltd.

(Above) The bar of the Parade Wine Lodge, Worthing, surfaced with Warerite.



(Left) Stainless steel pipes and nylon unions ready for installing. In the background can be seen Perspex sight tubes on the conditioning tanks, at Watney Combe Reid & Co., Ltd., bottling store.

(Right) Vertical barrel cover in nylon finish p.v.c. manufactured and printed by Delmore Ltd.

(Left) Acrylic drip catching bowl manufactured by Thermo-Plastics Ltd.

(Above) Anti-corrosive pipe joint in Bakelite material.

(Below) Warerite bar counter with an original design incorporated in its surface, at Scullards, Southampton.

(Left) P.v.c. pump handle cover and barrel cover made by B.X. Plastics Ltd.

(Above) "The Dick Turpin" bar, Ilford, faced with birds-eye maple Formica laminate.

LETTERS TO THE EDITOR

Correspondents are reminded that a stamped and addressed envelope should be enclosed in all cases where a personal answer is desired. It is understood that any letter received may be published at the discretion of the Editor.

Scent Spray Inquiry

SIR,—We wish to get into touch with the makers of the Atomist plastic scent sprays. Will you kindly let us know their name and address.

LEVETUS, LTD.

194 Bishopsgate,
London, E.C.2.

Physical Testing

SIR,—In view of the increasing demand for the routine testing of plastics materials, we have decided to extend the facilities hitherto available in our Physical Testing Department, and establish this on the basis of an independent company to be known as Dr. V. E. Yarsley (Plastics Testing Laboratories), Ltd. The new company will continue to meet as hitherto the needs of all existing clients of Dr. V. E. Yarsley (Research Laboratories), Ltd. In addition it will provide facilities for independent testing to official and specific specifications. The business of the new company will be directed by Dr. V. E. Yarsley, and will be managed by Mr. G. C. Ives, B.Sc., A.R.I.C., A.P.I., who has to date been in charge of the Physical Testing Department. We trust that this new arrangement and the extended facilities, which in due course will accrue therefrom, will enable us to offer increased and even more economic service.

DR. V. E. YARSLEY
(RESEARCH LABORATORIES), LTD.

"Oaklands,"
Clayton Road,
Hook, Surrey.

Plastics Material for Window-boxes

SIR,—I am very interested in using plastic boards for the making of floral or window-boxes. A material about ¼-in. to ⅜-in. thickness is required.

The material would be cut to standardized lengths and widths and drilled for bolting or screwing to prepared framing.

HENRY CHITTENDEN.

16a Powis Square,
Brighton, Sussex.

Transparent P.V.C.

SIR,—As publishers of the leading magazine dealing with British plastics, we wonder if you could help us with some information of possible suppliers of clear rigid polyvinyl chloride (p.v.c.) in coil or reel form.

We have seen some rigid p.v.c. of Continental manufacture which has a smooth and not unpleasant surface, but unfortunately this material is translucent or milky in colour. We are also anxious to obtain some information about polyvinyl acetate.

THE SHANNON, LTD.

Shannon Corner,
New Malden, Surrey.

Spraying of Polythene

SIR,—We should be obliged if you would give us the address of manufacturers of the type of tool used in the spreading of polythene powder on to metal surfaces.

We believe that this process, by which it is possible to coat metal structures such as acid-resistant containers, is already applied on a large scale in your country.

LAVORAZIONE TERMOPLASTICI
INDUSTRIALI S.r.l.

Corso Venezia,
Milan, Italy.

Styrene for Water Meter Parts

SIR,—One of our subscribers is trying to track down a report that one or more manufacturers in England are now using high styrene resins in place of hard rubber in the production of water meter parts.

We would very much like to learn the name and address of one or more such manufacturers and particularly would like to secure any data which may have been published regarding the performance of the high styrene parts.

"RUBBER AGE."

101 West 31st Street,
New York, 1,
New York State, U.S.A.

Aluminium Powder and Colours

SIR,—Would you be good enough to let us know of a source for cheap supply of aluminium powder (not ground in oil and suitable for vinyl resins).

Also do you know of a source of dry colours, especially red iron not reactive, i.e., relatively pure?

E. T. and J. T. S. HEWITT.

Butley Mills,
Woodbridge,
Suffolk.

Glass-impregnated Plastic

SIR,—We wish to contact makers of a glass-fibre impregnated plastic material which is sold under the trade name Stypol, and it would be greatly appreciated if you could let us know the name and address of the firm in question.

A. JOHNSON AND CO. (LONDON), LTD.

Dukes Road,
Western Avenue,
London, W.3.

Polythene Watering Can

SIR,—We are most anxious to obtain the supply of a polythene watering can complete with rose, and also to obtain the name of the manufacturer of Clearsite non-toxic p.v.c. tubing for use for the delivery of beer, wines and spirits, and mineral waters.

GLOVER & WOOD, LTD.

Victoria Works,
Leeds, 11.

Shaving Sticks

SIR,—Through your contacts within the plastics industry are you able to put me in contact with a firm able to supply plastic cylindrical cross-section screw base shaving stick containers?

J. DAVIS.

163 Carlton Road,
Gidea Park,
Essex.

Plastic Threads

SIR,—We are anxious to get into touch with a manufacturer of plastic thread used in the manufacture of pot scourers. We write to ask if you think any of your correspondents or advertisers could help us?

MERTTENS AND CO.

6 Gt. Marlborough Street,
Manchester, 1.

P.V.C. Sheet

SIR,—My husband, who is a disabled ex-serviceman, and who is making a great effort to become a useful member of society, is making window decorations from p.v.c. Unfortunately he has not been able to purchase supplies of this material in quantities less than a roll at a time and I am afraid we are not in a position to take such a quantity. His modest requirements are just small pieces of opaque p.v.c. sheet 4 or 5 thou. thick and similar quantities of rigid p.v.c. sheet. If there is anything that you can do to assist us in this way we should be most grateful.

MRS. B. KEY.

4 Middle Street,
Beeston,
Nottingham.

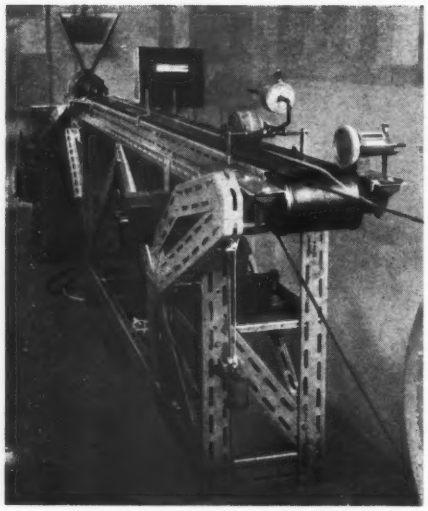
Acrylic Wine Glasses

SIR,—In *Plastics*, for March, 1955, page 81, is shown a wine glass. Could you please tell us where these could be obtained?

R. JORDAHN.

Helgolandsgade 2,
Copenhagen, K,
Denmark.

[EDITOR'S NOTE: The manufacturers are Clearex Products, Ltd., Heather Park Drive, Wembley, Middlesex.]



Fastening System Fabricated from Extruded Polythene and P.V.C.

Extruded P.V.C. and polythene sections are used in the Flexigrip and Flexitite fastening systems. The manufacturing process and various applications are described herewith.

Fig. 1. View of extrusion line for fastener.

TWENTY years ago, or thereabouts, the metal Zip-fastener opened a new era for corsetieres, handbag manufacturers, dressmakers and the like. However, notwithstanding the wide field of application open to this new fastening system, there were several intrinsic disadvantages. Metal fasteners, mounted on fabric tapes, tended to snag or jam; they were also not weatherproof, dustproof or watertight. And it was therefore obvious that the last word had not been said on such closures.

A Danish inventor, Borga Madsen, is responsible for the latest development, the plastic fastener which, whilst not yet entirely suitable for consumer use, is now appearing in many commercial products and which is in fact water- and dustproof and 99% airtight.

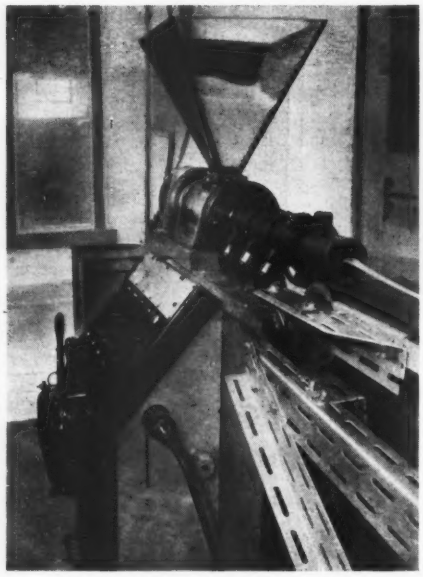
British Development

The licensees of the British development of this fastening system are Flexigrip, Ltd., 49 London Wall, London, E.C.2. Used with the Flexigrip system is the traditional metal slider, which is designed in a special way. An alternative variation is the Flexitite fastener (without a slider) which simply closes by pressing both sides together, and opens by lifting one of the sides. As will be seen later this alternative has special advantages to offer in certain fields of application.

Extruded Sections

Prominent in the manufacture of this fastening system are Melwood Thermoplastics, Ltd., of Harpenden, Hertfordshire. Using a specially developed p.v.c. compound, and polythene, the company's extrusion plant is supplying all the requirements of the Flexigrip organization for Britain. A general view of a typical extrusion line is shown in Fig. 1. The extruder itself has a 1½-in. diameter screw, this being specially developed for the purpose. Fig. 2 shows a close-up view of the die head in which can be clearly seen the profile section; this in fact constitutes the Flexigrip or Flexitite fastening system. The die head and barrel are heated to temperatures normally used for p.v.c. and polythene for this type of section.

The extruder used in this particular line was designed and built by Melwood Thermoplastics. It has four temperature control units (Fig. 3); the barrel proper is heated by three



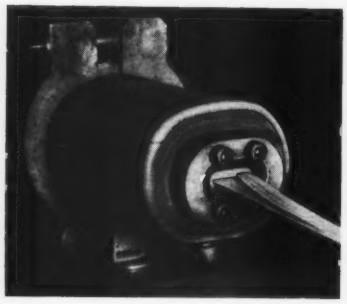
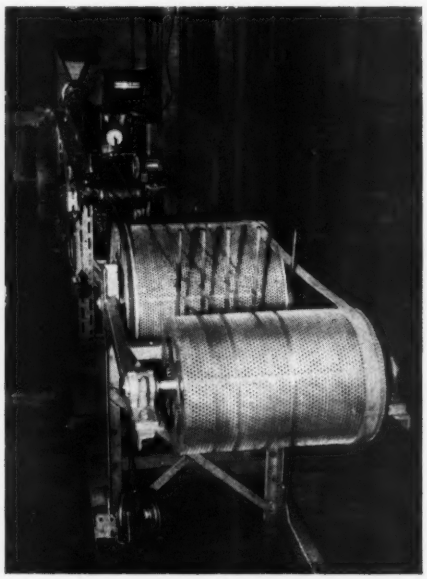


Fig. 2. (Above) Die head for Flexigrip section.

Fig. 3. (Left) Extruder, showing heater bands and control panel.

Fig. 4. (Right) Take-off and cooling mechanism.



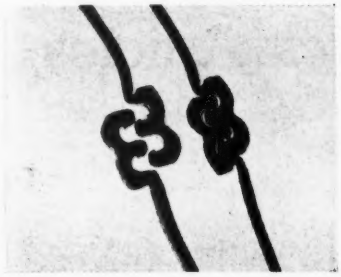


Fig. 5. (Above) Cross-section of fastener, showing it open (left) and closed (right).

Fig. 6. (Right) Moth-proof bags for blankets.

special strip elements. The take-off equipment is essentially a rubber-faced continuous belt mounted on a framework constructed of Dexion metal. The extrusion is drawn on the belt and measured continuously, after which it is taken on to the air cooling system which is moving at the same rate as the take-off belt, being connected to it by a pulley drive. Fig. 4 shows the simplicity of this system which carries the extrusion about six times backwards and forwards over the major and minor drums in order to ensure that the extrusion has settled satisfactorily. Both the major and minor drums are built on the principle of circular sieves, providing for maximum air penetration. The movement of the extrusion over the drums is controlled by the vertical bars which can be seen in the centre of Fig. 4. The cross-section of the extrusion is shown clearly in Fig 5. It will be seen from this that accurate extrusion is essential if a trouble-free product is to be made. Considerable time was therefore spent in the designing of this extrusion line with the result that the complete unit is now a remarkably smooth-running system, which operates to very fine limits.

The essential difference between the Flexigrip and Flexitite principle lies in the size and design of the extruded ribbon. As explained previously, the Flexigrip system is worked by means of the metal slider, whereas the Flexitite system is designed to work without. Flexitite is very suitable for the solution of many packaging problems and particular progress has been made in this field in the United States.

Fig. 7. (Above) Briefcases in p.v.c. with fastener welded into position.

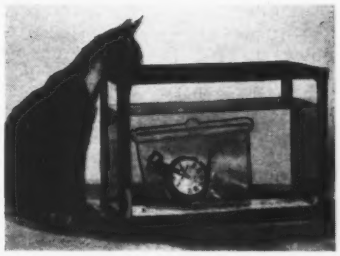


Fig. 8. (Right) Demonstrating the waterproof properties of the Flexitite system.

Uses for Flexigrip

Figures 6 and 7 illustrate typical uses of the Flexigrip system. In each case, the extruded strip is heat-sealed or electronically welded to a main plastic structure, thus providing a homogeneous system. It is a feature of this process that each Zip-fastener unit is made up from identical material and not crossed with products of other extrusion lines. This ensures a perfect fit. Whether a fastening system is used for raincoats, garment bags, picnic bags, oxygen canopies, or toilet kits, the product has the same valuable properties; there is no canvas to rot, no metal teeth to rust, and the strength and performance are eminently satisfactory.

Being supplied in coils, the fastener is convenient for the user who can cut it to the desired length; this offers considerable economy in use and gives greater flexibility to the designer.

In Fig. 9 is shown a typical application of Flexitite. It is most effective as a seal for a tobacco pouch, as a closure for a picnic envelope to keep sandwiches fresh, as a fastener for toilet packs, and as an aid to retail sales, as a packing medium for shirts, gloves and other soft goods items. It is interesting to note that in America, the development of the plastic " zipper " was turned over to the design students at the Pratt Institute in Brooklyn, New York, where some of the applications shown on this page, and hundreds of others were devised on a production scale.

American Applications

Outstanding applications in America include vacuum-cleaner bags and closures for pipe lagging. In the latter instance, glass wool or other insulating agents are contained around the pipe by means of a p.v.c. bag, which is closed with the Flexigrip system. Not only is complete protection afforded to the lagging material, but inspection of the pipe itself is greatly facilitated.

Throughout the world, this novel fastener, in both its forms, is finding considerable application in both industrial and consumer markets.

The Production of Blown Plastics Articles

The following translation comes from an article appearing in the January issue of the well-known German technical journal, "Der Plastverarbeiter." It is with the kind permission of the editor and publisher Kurt Brandenburger that we are able to reprint it here.

By H. SPIES

BOTTLES of polythene and other thermoplastics are blown in a similar manner to glass bottles. The process, however, is not as simple as in the blowing of glass as it has previously not been possible to form a lump of highly viscous plastic inside a mould by a blowing technique. Instead of the comparatively low pressures obtained by blowing with the mouth, compressed air, at a pressure of 42 lb./sq. in., is required. For producing a bottle, preforms in the shape of a cylinder (Fig. 1) or a tube (Fig. 2), welded at the bottom and being in an extensible state by heating, are necessary. The sealing and welding of the tube end (Fig. 2) is usually carried out by the closing of the mould.

Fig. 1.

Fig. 2.

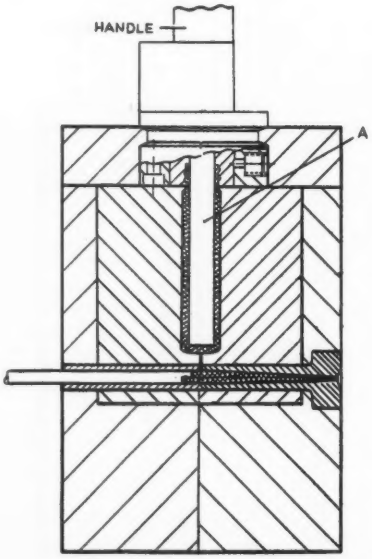


Fig. 3. Injection mould.

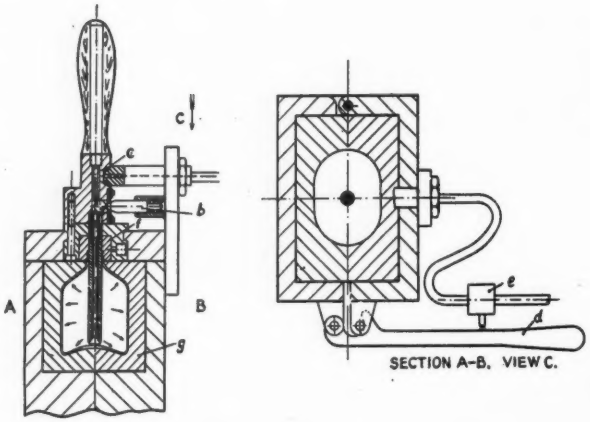
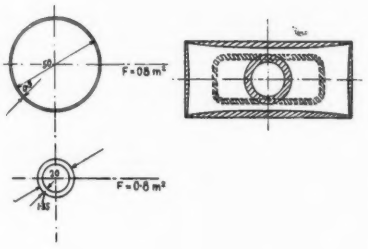


Fig. 4. (Left) Tool for blowing an injection moulded preform.

Fig. 5. (Below) Preform sizes and cross sections.



Similar to the mass production of glass bottles, plastic bottles are produced on fully automatic machines (Plax patents), which are operated on the round-about principle. As these machines require high capital investment, in the following notes equipment will be discussed which can be produced at a comparatively low cost.

Injection Moulding

A cylinder is formed on a standard injection moulding machine by a simple

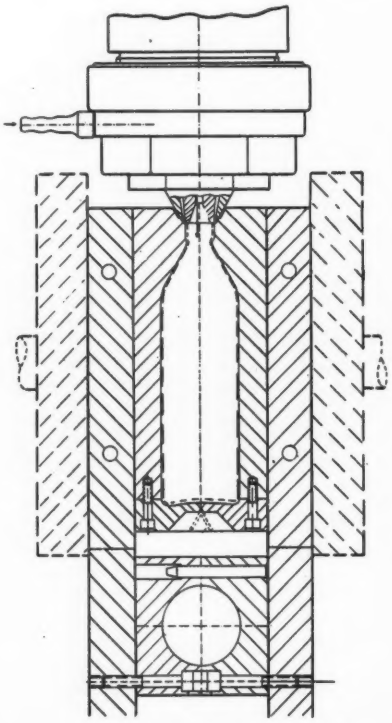


Fig. 6. Extrusion bottle mould.

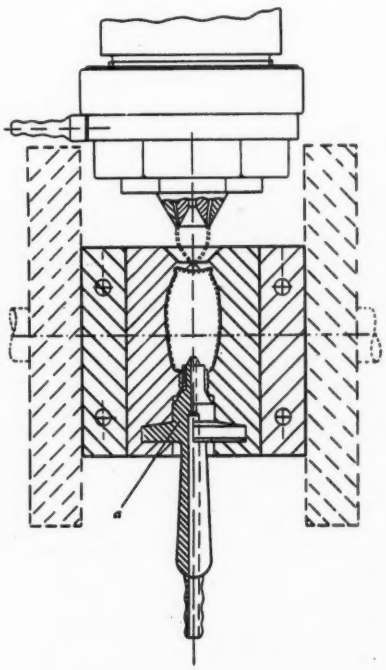


Fig. 7. Mould for accurate neck forming.

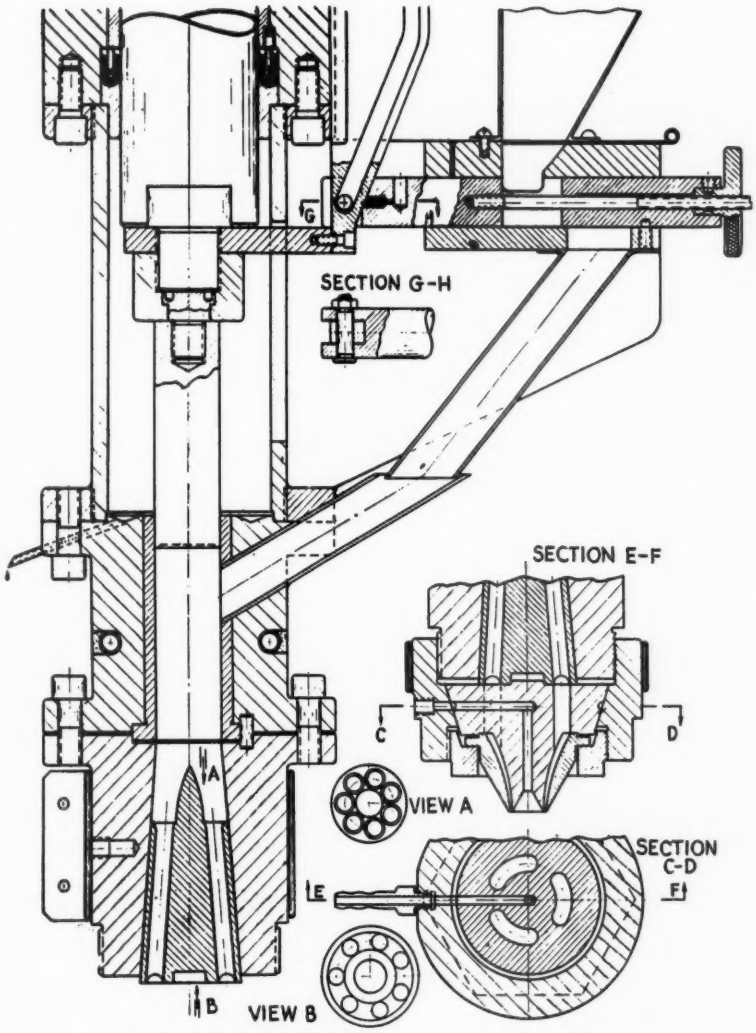


Fig. 8. (Above) Bottle forming machinery based on an old injection moulding machine.

tool (Fig. 3). Immediately after injection the mould is opened and the core "A" with the still hot and plastic preform is taken out and brought immediately to the mould (Fig. 4) for blowing. When closing the mould a spring-loaded pin "b" presses against a steel ball and slightly opens the air passage. At the same time the compressed air connection "c" provided with a rubber sealing ring, presses into a corresponding conical hole in the core.

When the mould is completely closed, locking lever "d" operates the air valve "e" and the preformed cylinder is blown against the walls of the mould. After the moulding has solidified, the mould is opened, so that core and bottle can be taken out.

In this instance the finished bottle can be screwed out by its external thread from the core. In order to obtain a higher capacity several cores are made available. The threaded insert "f" for the core is exchangeable, so that bottles with different threads can be made and the actual mould for blowing "g" is also exchangeable, in order to produce different bottle shapes. In the majority of cases it is necessary for the actual injection mould die to be exchangeable also.

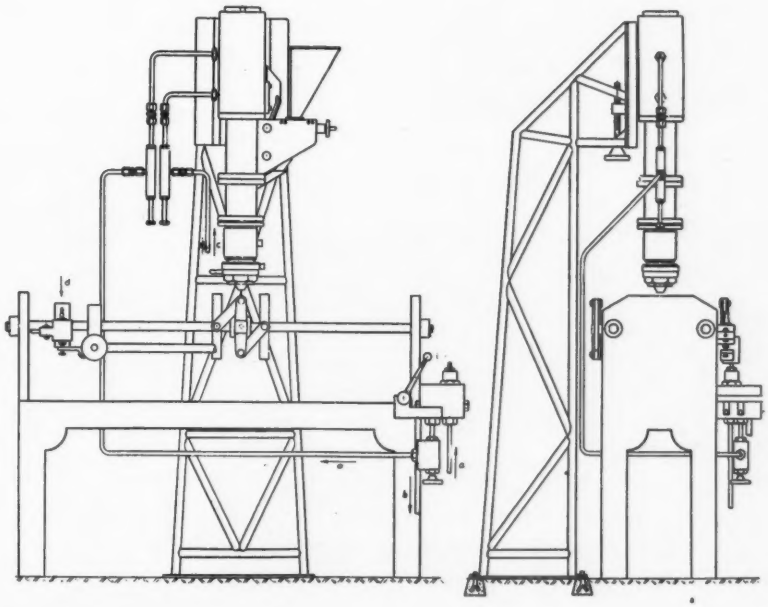
Preform Sizes

If a bottle of 2-in. diameter should have a wall thickness of 0.5 mm. (0.020 in.), the ring area (Fig. 5) is about 0.8 sq. cm. With the same ring area the tube with an outer diameter of only ¾ in. will have a wall thickness of 1.35 mm. (0.053 in.). If bottles of square or rectangular cross-section have to be made from cylindrical preforms, the material would be stretched too much at the corners (Fig. 5), therefore the use of oval or rectangular preforms is to be recommended in order to avoid too great differences in wall thickness.

Extrusion

The most common method in the production of bottles is to extrude a tube into the mould, whilst the two parts of the mould are closing. The base of the mould nips the bottom of the tube and thus welds it. Directly after closing the mould compressed air is blown through the mouth-piece into the tube which, because of its plastic state, expands to the form of the mould. In this way bottles of a great variety of shapes (including those with external thread) can be produced (Fig. 6), in quantities up to about 180 pieces per hour. If, however, bottles with an accurate internal neck diameter are required, one can use the same equipment with the difference that the air supply is changed from the mouth-piece to the bottom of the bottle (Fig. 7), the bottle being actually moulded in the inverted position. The tube is welded, by the closing of the mould, close to the nozzle and compressed air enters through the core "a" at

Fig. 9. (Below) Showing a general view of the machine when assembled.



the base of the mould. After cooling, the mould is opened and the core and bottle removed.

In this manner bottles with accurately sized neck diameters are obtained, but production by this method is considerably less, the average being in the region of 75 bottles per hour. It is necessary for the moulds to be effectively cooled to obtain a rapid solidification and consequent economic production rate.

Polythene bottles of a milky white, semi-transparent appearance, having a partly grained surface and partly transparent stripes, in an axial direction, show that the polythene melted incompletely before the forming of the tube. As polythene is thermally very stable there are no great difficulties to ensure a uniform melting. This can be achieved by forcing the material in the heating cylinder through a number of small-sized holes before it reaches the actual nozzle (Fig. 8).

Drawings

Fig. 8 and the following drawings show equipment for blowing bottles, using the main components of an older injection moulding machine. Fig. 9 is an assembly drawing; the machine base is that of a discarded EL 7 machine. The closing mechanisms, in contrast to the usual injection moulding machines, are operated from both sides. The hydraulic cylinder and the injection cylinder are placed vertically owing to the hanging arrangement of the tube. The injection cylinder is adjustable in a longitudinal direction. The pressure tubes leading from the control valves to the cylinder have also to be made adjustable in longitudinal direction; this is made possible by a telescopic arrangement (Fig. 10). Figs. 11 and 12 give details of the feeding device. The speed with which the tube is formed must be infinitely variable; therefore, between the cylinder and control valve an adjustable throttle valve (Fig. 13) is included. As on this machine the air has to be blown partly from the top, partly from below, a two-way control valve (Fig. 14) is provided.

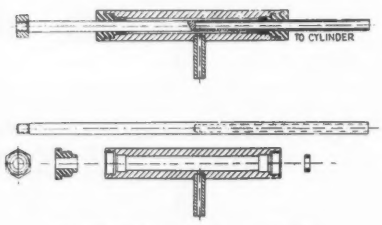


Fig. 10. Telescopic pressure tubes.

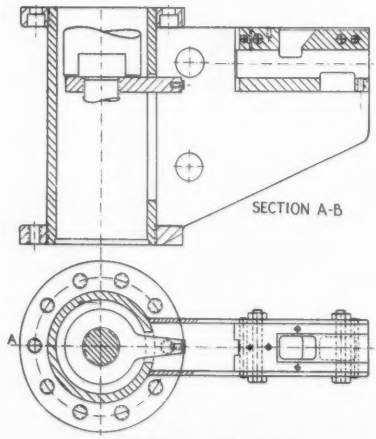


Fig. 11. Feeding mechanism.

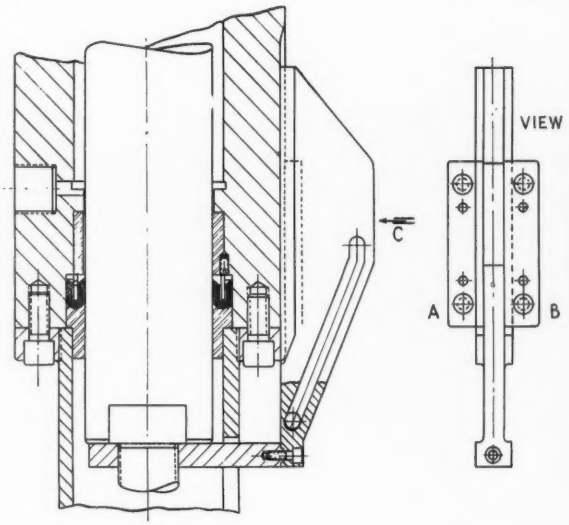
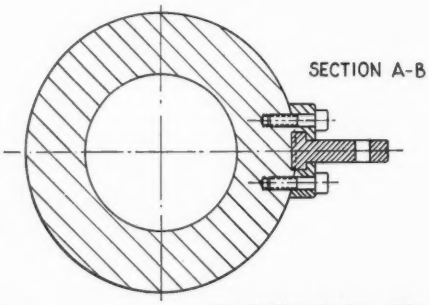


Fig. 12. (Right) A more detailed drawing of the cylinder and feed cam plate.



Figs. 13 and 14. (Below) Adjustable throttle valve and two-way control valve.

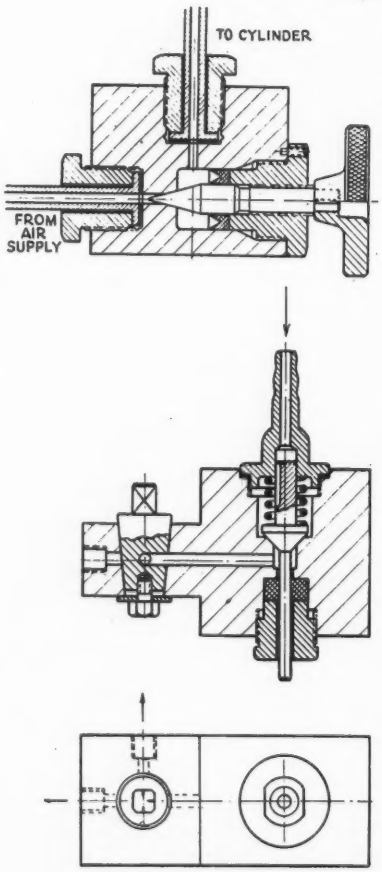


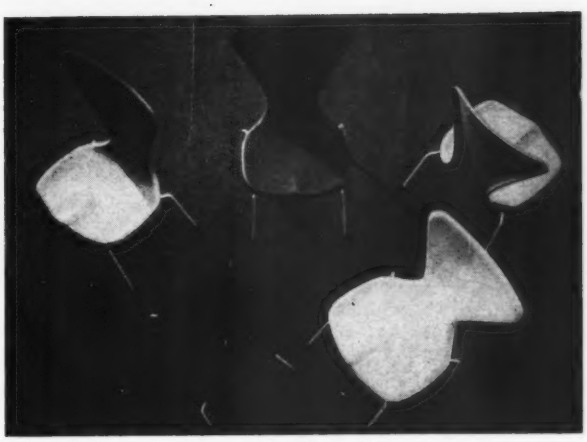
Fig. 9 shows that the air inlet valve is automatically operated by the closing lever of the machine so that the bottle is blown immediately after the mould has been closed.

Editor's Note: Readers of this German translation will no doubt note the relatively small financial outlay required for the manufacturing equipment described, but whether the process and production rate of the product are such as to make the installation and manufacture of this equipment an economical proposition for other than experimental purposes and short runs is a debatable point.

An interesting comparison can be made between this article and one which appeared in the August, 1954, issue of *Plastics*. In this appeared a description of the different methods of producing bottles with a special reference being made to the semi-automatic and automatic machines manufactured by E. Shipton and Co., Ltd., Northwood Hills, Middlesex. The methods described included, injection moulding and sealing, injection moulding and blowing, and, extrusion followed by blowing. The second method is similar in many respects to the first one described here but more fully automatic and would probably give more uniform results.

New Productions

Safety goggles moulded in nylon.



Polyester glass-fibre chairs.

Safety Goggles

Nylon mouldings have been used in the manufacture of the safety goggles illustrated above. The eyecups, which are shaped to the orbital cavity, can be sterilized with complete safety, a feature of moulded nylon.

The bridge connecting the eyecups has been specially designed so as to be completely adjustable. Further details can be obtained from Safety Products, Ltd., St. George's House, 44 Hatton Garden, London, E.C.1.

Glass-fibre Chairs

The stacking chairs made from glass-fibre reinforced plastics have been designed by David Woulfe, M.S.I.A., of Story and Co., Ltd., made by Semtex, Ltd., a Dunlop company, for distribution by Multi-Spring Ltd. These chairs have great durability, strength and flexibility and the moulded shape of the chairs give the maximum seating comfort.

The rust-proofed steel leg unit is white plastic covered which, combined with the easily cleaned impervious surface of the chair, affords maximum protection against damage and wear. The "Glastic" chair will not dent, splinter or lose its shape and is unaffected by extremes of climate, moisture or weak acids and alkalis. It is, therefore, suitable for community halls, canteens, restaurants, lecture halls and public rooms of all kinds.

They are self-coloured throughout in black, red, light green and beige. Stacks of chairs are easily packed without dismantling for export. Fuller information is obtainable from Story (Fabrics), Ltd., Kensington High Street, London, W.8.

Beads in Polythene

Chelton (Electrostatics), Ltd., of Marlow, Bucks, have injection-moulded the beads illustrated in polythene. The examples shown are coloured in pale pink, and have a deep lustre which has secured for them great interest in the London stores. As will be seen from the close-up photograph, each bead has a protruding nipple on one side, accompanied by a moulded recess on the other. Assembly of the beads is thus a simple matter of pressing them together. The shape of the nipple ensures that the beads are connected quite freely and hang almost as loosely as the ordinary row of beads strung on thread. A feature of the sales campaign is that the beads can be lengthened and shortened as desired, and can also be turned into bracelets.

Adhesive Dispenser

A neat device for solving gluing problems has been introduced by Quickbinde, Ltd., 195 Sloane Street, London, S.W.1. With the exception of an internal spring, the unit is entirely in plastics. The band, cap, and head are injection-moulded in polythene, and the projecting stud is moulded in polystyrene. The head can be quickly unscrewed to permit refilling with the adhesive which is of the vinyl acetate type.

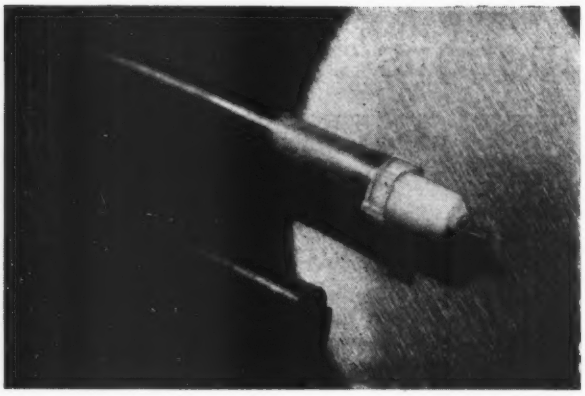
To use the dispenser, it is merely necessary to press the stud against the paper. This causes a small quantity of adhesive to be ejected. Amongst the uses claimed are the sealing of small parcels, as a replacement for paper clips, to stop runs in stockings, and to stick models together.

Polystyrene Food Container

Halex, Ltd., Highams Park, London, E.4, have introduced a new container in their range of Bex household utensils. As will be seen in the photograph, this one has been designed to hold biscuits, small cakes and buns. The body is in clear material, the lid in red, green or ivory with a recessed finger grip. Both are injection-moulded productions in polystyrene.

(Above) Close-up of beads to show method of assembly.

(Right) This necklace is made up of small polythene mouldings carried out by Chelton (Electrostatics) Ltd.



(Left) Pocket adhesive dispenser moulded in polythene.

(Right) Industrial pail which holds 2½ gallons. Moulded by Halex.

Polythene Pail

This new Bex polythene pail has been designed primarily for industrial and institutional purposes. Larger than the original domestic model, it holds 2½ gallons and has a heavy quality steel handle completely encased in polythene, giving full protection against acids and other corrosive fluids. It is calibrated on the inside in gallons and litres. The retail price is 27s. 6d. and the colours are green, red and ivory. The manufacturers are Halex, Ltd.

New food container in the Bex range of household utensils.

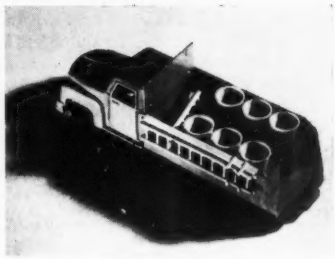
The "Dorma" Travel Pack

Diothene bags produced by the Metal Box Co. (Flexible Packaging Division) can be adapted to many different purposes. One such bag, made for Messrs. J. F. and H. Roberts, forms the container for a hand-towel and face-cloth of the usual size, folded flat. The bag and its contents together form an excellent pack for travelling, called the "Dorma" travel pack. This pack is compact enough to fit into a week-end or train-case, into the pocket of a rucksack, into a picnic basket or beach bag or even into one compartment of a briefcase or large handbag. Since the Diothene bag is strong and waterproof, it gives complete protection, even when the contents are damp. The "Dorma" travel pack takes up hardly any space, and it is very light in weight—an invaluable asset when travelling by air. Diothene is the Metal Box trade name for polythene film.

Polythene Used in Farm Equipment

The "Clydebuilt" auto-control cow and pig drinking bowl is the perfect insurance against the continual risk of scour and low food conversion caused by overdrinking in hot weather or an excessive supply of chilled water in winter. It is self-filling, has no animal-operated levers and makes use of a restricted inflow to control the amount of water taken by the cow or pig. These bowls have an automatically maintained water level, cannot overflow, require no maintenance and are not subject to frost damage in winter, an essential feature for farmers.

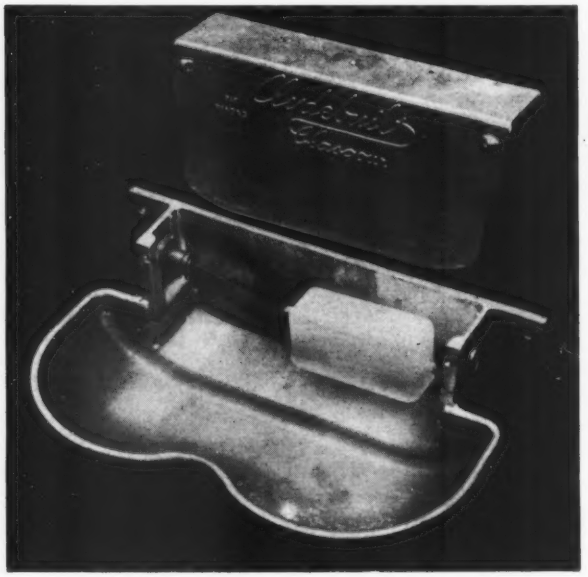
The float shown in the photograph is blown from polythene by Lacrinoid Products, Ltd., Gidea Park, Essex. It is completely unbreakable, not affected by corrosion and easily adjustable to varying levels of water height.



Polystyrene toy.

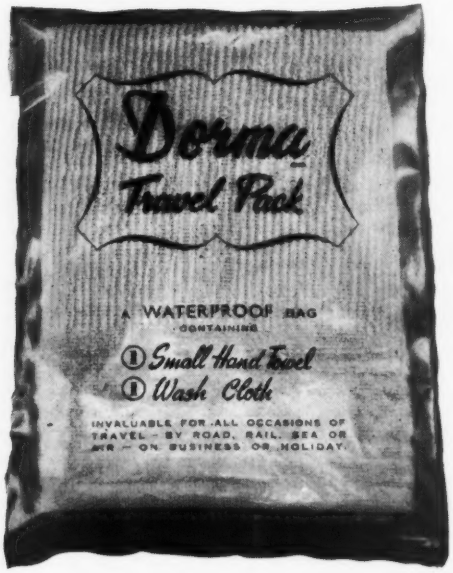
Toy Truck

The toy decorators' truck illustrated above has been injection-moulded in the new high impact polystyrene marketed by Kleestron Ltd., West Halkin House, West Halkin Street, London, S.W.1.



(Left) This pig drinking bowl has a float which has been blown from polythene.

(Right) Container, in polythene, for hand-towel and face-cloth.


Dorma
Travel Pack
A WATERPROOF BAG
CONTAINING
1 Small Hand Towel
1 Wash Cloth
INVALUABLE FOR ALL OCCASIONS OF TRAVEL - BY ROAD, RAIL, SEA OR AIR - ON BUSINESS OR HOLIDAY

Plastics NEWS

Raw Materials, New Plant, Works Organization, Control Apparatus, Research, Personal and Trade Notes

DEFLASHING OF PLASTICS MOULDINGS.—Lacrinoid Products, Ltd., Gidea Park, Essex, in their technical bulletin No. 1, give details of the deflashing of plastics mouldings.

Deflashing can be carried out in a steel barrel using various sizes of steel balls. The following procedure is recommended: Load the barrel up to one-third of its capacity with steel balls and add one-third of mouldings. Great care should be taken to ensure that the steel balls will not nest in any section of the articles. The water height should be 2 in. (50 mm.) above the total load. Add compound B2 at the ratio of 1 oz. (28 grammes) per 1 gallon (4½ litres) of water. This method is particularly useful when internal flash lines have to be removed.

The use of Lacron chips have shown good results when deflashing mouldings made from urea formaldehyde moulding powder, cellulose acetate, cellulose nitrate, methacrylate and phenolic casting resin. Lacron chips should not be used for treating phenolic mouldings.

LEC MOISTURE MASTER.—Manufactured by Lec Refrigeration Ltd., Shripney Road, Bognor Regis, Sussex, this machine is a portable air-drying unit with a capacity of up to 20 pints of water removed every 24 hours. This machine should be suitable for use in unheated store-rooms and in workshops where tools and accessories can be protected against rust.

CENTRELESS GRINDING MACHINES.—Two new grinding machines have been added to the range of Arthur Scrivener, Ltd., Tyburn Road, Birmingham, the No. 2 model G and the No. 2 controlled-cycle machine. In the latter machine, a hydraulically operated reciprocating cam plate of suitable profile enables a wheel-opening movement of up to 1 in. to be obtained. This provides an alternative method of ejection which facilitates the removal of small-diameter pointed workpieces and shouldered components which cannot be pushed through by the incoming piece. The main field of application for this machine is for plunge-grinding, although straight-through grinding can be carried out if the controlled-cycle mechanism is disconnected.

UNIVERSAL TESTING INSTRUMENT FOR PLASTICS.—A table model of the Instron testing machine has been developed for the plastics industry. The machine records, electronically, stress/strain curves under tension or compression. The manufacturers are Instron Engineering Corporation.

OVERDRIVING AND IRREVERSIBILITY IN WORM GEARING is the subject of the John Holroyd and Co., Ltd., News Letter. Some of the conclusions reached and the importance of the lead angle and angle of friction are set down.

SELF-EXTINGUISHING FIRE-RESISTANT POLYESTER RESIN.—According to a recent announcement by Scott Bader and Co., Ltd., a new polyester resin, Crystic 300, has been developed by them, having fire-resisting properties without the necessity of using fillers. Inquiries should be sent to 109 Kingsway, London, W.C.2.

DETECTION OF CHLORINE.—A revised edition of leaflet No. 10 in the series, "Methods for the Detection of Toxic Gases in Industry," has been published for the Department of Scientific and Industrial Research by H.M.S.O., price 9d. It deals with chlorine, a material widely used in industry. It is an acute irritant and there is always a risk of exposure during both its manufacture and use. Very low concentrations of chlorine may be dangerous on prolonged exposure. Apart from other detailed information such as first aid, the pamphlet outlines a practical test for detection of the gas without requiring a very large sample.

ISOPROPANOL.—A new booklet issued by Carbide and Carbon Chemicals Company, a division of Union Carbide and Carbon Co., gives details of the properties of isopropanol which has many applications as a solvent, extractant, intermediate, germicide, and petroleum additive.

"CELLOSOLVE AND CARBITOL SOLVENTS" is the title of a new booklet published by Carbide and Carbon Chemicals Company, 30 East 42nd Street, New York 17, New York. The booklet describes in detail the nine commercial glycol-ethers sold by the company, including a section devoted to specifications and test methods.

PRODUCTION OF PHOSPHATES IN THE U.K.—Monsanto Chemicals, Ltd., are forming a new wholly owned subsidiary, Monsanto Phosphates, Ltd., who will erect and operate plants for the production of sodium phosphates and other phosphorous compounds. The first plant is to be installed at Newport, Monmouthshire, for the production of sodium polyphosphate.

HIGH-IMPACT POLYSTYRENE.—An addition to the range of Kleestron moulding materials is Kleestron H, a high-impact polystyrene. Izod notched impact strength figures are from 0.6 to 1.0 ft./lb. and tensile strength 4,000 to 5,000 lb./sq. in.

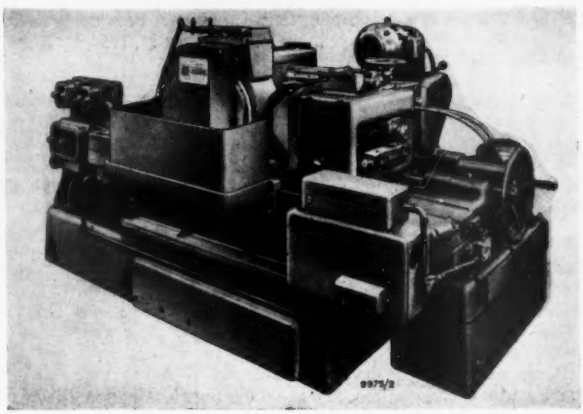
MONOMERIC STYRENE PRODUCTION.—Increased demand for styrene monomer has initiated a further expansion project for Forth Chemicals, Ltd. They are already well on the way to the completion of the first project for doubling the capacity of their plant at Grangemouth and it is expected that the entire programme will be completed early in 1956.

CHEMICAL COMPANIES MERGER.—Witco Chemical Co., of New York, have recently acquired a half interest in Ultra Chemical Works Inc., of Paterson, N.J. The English company, Witco Chemical Co., Ltd., has a plant at Droitwich and offices in London and Manchester.

COLOUR PASTE CONCENTRATES.—Two technical bulletins from Claremont Pigment Dispersion Corporation give details of their colour pastes for colouring epoxy, thiokol, polyurethane and isocyanate resins, and vinyl plastisol compounds. These may be obtained from the above corporation at 110 Wallabout Street, Brooklyn 11, New York.

OIL AND COLOUR CHEMISTS' ASSOCIATION.—At the 1955 conference to be held at Llandudno the subject for discussion will be film, structure and adhesion. Papers to be read include: "Some Recent Developments in the Mechanical Testing of Materials," A. Jobling, Ph.D.; "Composition/Property Relations in High Polymer Emulsions," J. H. W. Turner, A.R.I.C.; "Physical Characteristics of Epoxide Resin Films," Dr. T. F. Bradley; "Water Sorption in Polystyrene, Cellulose Triacetate and Polyvinyl Chloride below Saturation Vapour Pressure," A. G. Day, B.Sc.

CHANGE OF ADDRESS.—V.M.C., Ltd., have moved into larger premises at 73 Oakfield Road, London, S.E.20. Telephone number, Sydenham 4620.



The No. 2 controlled-cycle centreless grinding machine for plunge-grinding.

Dr. E. M. Evans

Mr. J. H. W. Turner

Mr. A. G. Catt-Camfield

NEW APPOINTMENTS.—British Resin Products, Ltd., announce the following appointments at their research and development laboratories. Dr. E. M. Evans has been appointed manager of the laboratories under Dr. J. J. P. Staudinger, research director.

Mr. J. H. W. Turner has been appointed manager in charge of the technical service and product development of the surface coating, adhesives and laminating, and moulding materials groups.

Mr. A. G. Catt-Camfield has been appointed manager of B.R.P. Research Division.

DR. H. M. STANLEY, newly appointed controller of research and development of The Distillers Co., Ltd., will shortly complete 25 years of research with the company. He became deputy controller of D.C.L. research and development in 1945. A graduate of Birmingham University, where he worked under the late Prof. G. T. Morgan, he is known particularly for his investigations into the production of petroleum derivatives and the economics of their application in the chemical and plastics fields.

AUSTRALIAN TOUR.—Mr. H. V. Potter, chairman and managing director of Bakelite, Ltd., is on an extensive business tour of Australia and New Zealand. In addition to examining economic conditions and market requirements, he will also be lecturing and presenting a new film dealing with the company's recently developed products.

Mr. E. J. Lassen, export manager, is accompanying Mr. Potter.

NEW APPOINTMENT.—Mr. Harold Rose has been appointed deputy managing director of Expandite, Ltd. Mr. Rose has acted as technical consultant to the company since 1948 and was appointed to the Board of Directors in 1953.

MR. FRANCIS L. WARING has been appointed managing director of Coalite and Chemical Products, Ltd., and its subsidiaries.

HOWARDS OF ILFORD LTD.—Mr. B. Thistlethwaite and Mr. J. L. Allison have been appointed to the board.

MOVE TO LARGER PREMISES.—Aero Research, Ltd., have moved their northern area offices to larger premises at 409 Royal Exchange, Manchester 2. Telephone number, Blackfriars 9445-6.

THE AEROGRAPH CO., LTD., OPEN NEW SALES OFFICE.—Sales and technical inquiries will now be handled exclusively at The Aerograph Co., Ltd., new sales office, 47 Holborn Viaduct, London, E.C.1. The factory and head office remain at Lower Sydenham.

NEW ADDRESS.—The offices of *Rubber Age* are now situated at 101 West 31st Street, New York 1, New York.

CHANGE OF ADDRESS.—The T.E.C. Products Division of Kodak, Ltd., have changed their address to T.E.C. Products Division, Kodak, Ltd., 1-4 Beech Street, London, E.C.1. Telephone No. is Metropolitan 0316.

PRODUCTIVITY.—Sir Ewart Smith, chairman of the British Productivity Council and deputy chairman of I.C.I., Ltd., in a recent article in the *Financial Times*, gave some illustrations of increased productivity in different fields of industry and the important part work study and the right attitude of mind plays in maintaining and promoting such increases.

SCIENTIFIC AND INDUSTRIAL RESEARCH REPORT.—The report contains several references to plastics materials although no investigation of the plastics industry is being carried out. Some of the more interesting disclosures are that unplasticized polystyrene has shown a hitherto unsuspected weakness as an insulant. The discharges liberate a trace of monomer which causes stress crazing and consequent rapid breakdown through the resultant cracks. The use of organic fillers in moulded plastics insulators is not recommended, the resistance to erosion by discharge being dependent upon the surface layer of resin. Once this has been penetrated the breakdown is rapid.

Plastics (presumably of the vinyl group) have been successfully used as printing plates in letterpress work. Trial runs of 80,000 impressions carried out at PATRA confirm that type matter of good quality can be successfully printed without make-ready.

Other references deal with polyvinyl acetate, styrene and epoxy and polyester resins in the surface coating industry.

In the chemical field good results have been obtained with the use of polyvinyl alcohol and methoxymethyl nylon membranes for selective analysis, one film having a marked increased selectivity with a comparable rate of solvent transfer, the other the same order of selectivity but with a greatly increased rate of solvent transfer, to the more conventional membranes. Copies of the report can be obtained from H.M. Stationery Office, price 9s.

CAPITAL EXPENDITURE IN CANADA.—Projected private and public investment in Canada for 1955 will be approximately 6% greater than in 1954 according to a report tabled in the Canadian House of Commons by the Right Hon. C. D. Howe, Minister of Trade and Commerce. The mining industry, with emphasis on further development in the petroleum field, is expected to show the most rapid increase, with outlays planned at a rate of 24% above 1954 levels.

REINFORCED PLASTICS IN THE U.S.A.—A recent report from the S.P.I. reveals a widening use of reinforced plastics. In 1954 more than 27,000,000 pounds of polyester resin and 10,000,000 pounds of fibrous glass were consumed. Main consumption is in tooling, car bodies, building units and aircraft. In the latter it is reported that there are more than 225 reinforced plastic parts on the F-84 Thunderjet. Recently a conference and exhibition was held in Los Angeles at which over 1,000 persons were present.

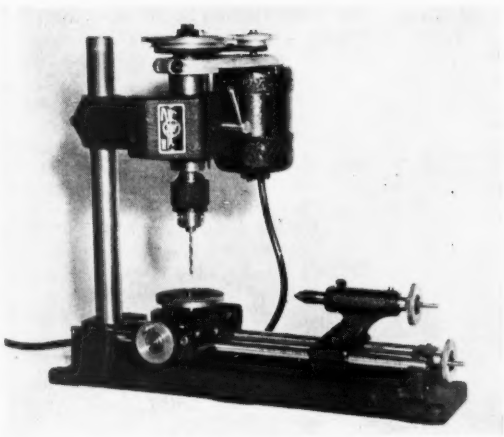
CONSULTATIVE COMMITTEE APPOINTED.—A committee has been appointed on the duty-free entry of machinery in accordance with the recommendation by the Wilson Smith Committee. Amongst the industrial members are Sir Laurence Merriam, M.C., M.A., director of the British Xylonite Co., Ltd.

GEORGE COHEN SONS AND COMPANY, LTD.—The directors of George Cohen Sons and Co., Ltd., engineers and iron, metal and machinery merchants, have declared an interim dividend of 3¼% actual, less tax, on the £1,500,000 Ordinary Stock of the company in respect of the year ending March 31, 1955, payable on that date (same).

PETROCHEMICALS, LTD., have received an offer of £5,000,000 from Shell Chemicals, Ltd., for the assets and undertakings of Petrochemicals, Ltd. The offer to shareholders is 4s. for each preference share and 2s. for each ordinary share.

INCREASED TRADING PROFIT.—An increased trading profit amounting to approximately £97,000 has been declared for the year ended December 31, 1954, by Blythe Colour Works, Ltd.

ASLIB MEETING.—An Aslib winter meeting was held at the Royal Society of Arts, 8 John Adam Street, London, W.C.2, on Friday, March 18, at 6 p.m. and took the form of a discussion meeting, led by Mr. G. A. Lloyd of the British Standards Institution, on recent developments in the Universal Decimal Classification. Mr. Lloyd proposed that the meeting should be devoted to U.D.C. matters of most interest to those who use—or are likely to use—the U.D.C., and who want to know more about how it is developed or to discuss some of the developments which have taken place recently at international or national level.



(Left) The Universal miniature machine tool, a full description of which was given in the March issue of *Plastics*, page 54.

(Right) Glass cloth epoxy resin laminate drilling jig for aircraft dorsal fins.

BRITISH STANDARDS.—Glass containers, B.S. 1133 Packaging code section 18. This standard provides guidance for the potential user in the most suitable type of container and in the most suitable type of closure be it rubber, metal, cork or plastics.

Polystyrene tiles for walls and ceiling. B.S. 2552. The standard specifies the dimensions, materials, capacity, colour fastness and workmanship of polystyrene tiles. Also specified are the methods of testing.

Plastics trays, B.S. 2581, covers the basic requirements for trays of thermoplastic or thermosetting materials for most normal uses. Four types of trays are specified.

Type 1. **Catering A.** Trays for cafeteria and hospital food service and conveyance, but excluding trays intended for direct contact with foodstuffs.

Catering B. Trays for cafeteria and hospital food service and conveyance intended for direct contact with foodstuffs.

Type 2. **Industrial.** Trays for storage and conveyance of goods during and after the process of manufacture.

Type 3. **Food.** Trays intended for direct contact with foodstuffs for display and storage.

The standard gives details of materials, use, excluding purely decorative use.

Trays for surgical use or purely decorative use are not specified.

The standard gives details of materials, workmanship, fittings and finish as well as providing tests for impact strength and heat resistance. A marking clause is incorporated drawing attention to the B.S. Certification mark, the use of which is optional.

Copies of these Standards are available from the Sales Branch of the British Standards Institution, 2 Park Street, London, W.1. Prices 6s., 2s. 6d., and 2s. 6d. respectively.

SAFETY AND FACTORY EFFICIENCY EXHIBITION.—The third exhibition organized by the Birmingham and District Industrial Safety Group will be held from June 24 to July 1 in Birmingham.

P. B. COW AND CO., LTD. Subject to a final audit the group trading profit for 1954 of P. B. Cow and Co., Ltd., has been declared as £750,341 against £451,660 in 1953. A final dividend of 17½%, has been recommended which together with the interim dividend makes a total of 25% for the year ended December 31, 1954. The annual general meeting of the company is to be held on April 28.

ROBERT MCARD AND CO., LTD.—The trading profit has increased from £56,310 in 1953 to £95,388 for 1954. The proposed final dividend is 25% in addition to the 20% interim dividend declared last September.

ANNUAL REPORT OF B.I.P.—A group profit, after taxation and depreciation, of £265,878 was shown in the statement of accounts for the year ended September 30, 1954. Mr. Kenneth M. Chance who resigned from the chairmanship and from the board has accepted the office of life president. In his statement he recalls the early work of the company and the great strides which have been made and ends by warning against trying to do too much and go ahead too fast.

Issued with the report was a small booklet illustrating the war record of Beetle cements for wood and the diversity of fields where they were employed.

STANDARD FOR PHENOLIC LAMINATED SHEET.—A new British Standard, B.S.2572 : 1955, specifies the requirements of phenolic laminated sheet in appearance, flatness, tolerance on thickness and marking of the material. Limits are also laid down for the following physical properties: Cross breaking strength, insulation resistance after immersion in water, and crushing strength after heating. Fourteen different types of material are covered. Copies of this standard may be obtained from the British Standards Institution, Sales Branch, 2 Park Street, London, W.1, price 4s.

This standard is complementary to, and does not supersede, the other standards for laminated sheet, namely, B.S.668, 972, 1137, 1323, 2076.

SURFACE COATING RESIN INDEX.—Published by the British Plastics Federation and Surface Coating Synthetic Resins Manufacturers Association, the index has classified into 14 sections some 733 British-made synthetic resins. A cross index of trade names and manufacturers is also given. Copies can be obtained from the British Plastics Federation, 47-48 Piccadilly, London, W.1, price 3s. 0d.

PLASTICS IN AIRCRAFT PRODUCTION.—Chance Vought Aircraft Inc. have reduced production time for a drilling jig for the dorsal fin of one of their aircraft. By using glass cloth laminated with epoxy resin, a stable tool with close tolerances was produced with no coping or machine time required.

Epoxy resin is also used as a protective layer on Kirksite stamping and drawing dies. The smooth finish eliminates a lot of machining time and also by using epoxy resins it is not necessary to recast cracked dies, the resin flowing into the crack providing a smooth surface.

EPIKOTE RESINS.—By arrangment with Shell Chemicals, Ltd., Albright and Wilson, Ltd., of 49 Park Lane, London, W.1, can now supply these resins to p.v.c. stabilizer users. They will be marketed under Albright and Wilson's own trade names and will include both the resins in unmodified form and compositions based on them.

PINNACLE PLASTICS, LTD., have now moved to new premises at 31 Guildford Street, Luton, Beds. Pinnacle Plastics, Ltd., are the manufacturers of the Pinnacle brand of polythene hardware units.

CENTRIFUGAL FANS IN P.V.C.—A complete range of centrifugal fans constructed entirely from rigid p.v.c. are now available from Turner and Brown, Ltd. (Industrial Plastics Division), Davenport Works, Davenport Street, Bolton. In addition to the fans, Turner and Brown manufacture ducting, fume hoods, tank linings, and pipelines, in p.v.c. and polythene.

HORNERS AWARD.—Regulations governing the Worshipful Company of Horners award for the best design of an article suitable for moulding or fabricating in plastics have been published. The competition is now open to employees under 30 years of age engaged in the plastics industry and not confined to employees of members of the Federation. Copies of the regulations can be obtained from the Director, British Plastics Federation, 47-48 Piccadilly, London, W.1.

T. I. PLASTICS LTD., has now become a separate company with the head office at Creda Works, Blythe Bridge, Stoke-on-Trent, Staffs.

CORRECTION.—In the March issue of *Plastics* we described the aircraft drop tanks manufactured by the Bristol Aeroplane Co., Ltd., as being made from glass fibre reinforced resin. We have since received a communication from Turner Brothers Asbestos Co., Ltd., stating that this is not so but are in fact produced from Durestos, the asbestos-thermosetting resin blended forms developed by the latter company and which are available as felt, flock and powder.

O. AND M. KLEEMANN, LTD., celebrated its golden jubilee by a luncheon given to several hundred customers and other friends at the Savoy Hotel, London, on March 30. The remarkable growth of this now large organization which began solely for the business of importing and exporting and which has now developed into one of our best-known plastic moulding companies, and more recently as a raw-material producing unit, was told by the chairman, Mr. Derrick Kleeman, who acknowledged the deep debt of gratitude he owed to his family forebears who began the business 50 years ago. Dr. J. E. F. Swallow, of I.C.I., Ltd., who proposed the health of the company, delivered a brilliant homily in praise of the work of the company and of the character needed to create such economic and technical entities.

MR. WILLIAM SHAW.—It is with regret we have to report the death of Mr. William Shaw on March 25. Mr. Shaw was for over 30 years head of the cable machinery engineering division of David Bridge and Co., Ltd.

MR. W. W. BALL.—We regret to record the death on February 2, 1955, of Mr. W. W. Ball. He was the founder of W. W. Ball and Sons, Ltd., plastic moulders and toolmakers.

STAFF APPOINTMENTS. — Mr. E. Leighton Holmes and Mr. C. J. S. Standen have joined the staff of Catalin Industrial Resins, Ltd., of Waltham Abbey, as senior research chemists.

PETROCHEMICALS DIRECTORS.—The directors appointed by the Finance Corporation for Industry, Ltd., to Petrochemicals, Ltd., have resigned from the board following its acquisition by Shell Chemicals, Ltd. A new board has been appointed from within the Shell organization.

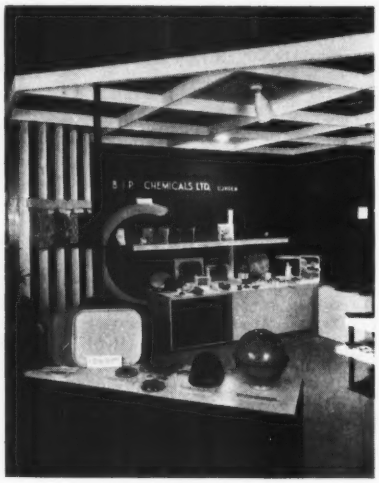
CHANGE OF COMPANY TITLE.—The Greenwich Leathercloth Co., Ltd., who are now concentrating solely on plastics materials, have changed the title of the company to Greenwich Plastics, Ltd.

TRANSFER OF FEROBESTOS TECHNICAL PLASTICS.—To allow for further expansion, Ferobestos Technical Plastics are being transferred from Ferodo, Ltd., to their associate company, J. W. Roberts, Ltd., Chorley New Road, Lostock, Bolton, who will handle all sales and service.

STEWART PLASTICS, LTD.—The address of Stewart Plastics Ltd., whose needlecraft box was featured on page 59 of the February issue of *Plastics* was incorrect. Their present address is Purley Way, Croydon, and not Brixton Hill.

"P.I.G.S."—Golfers, golf-widows and their friends and guests enjoyed an annual night out at the Savoy Hotel, London, on March 25. Mr. Cyril Last presided over the dinner, cabaret, film show and dancing.

B.I.P. CHEMICALS, LTD. — At the Utrecht Fair, Holland, in March, B.I.P. Chemicals, Ltd., showed on their stand mouldings from Beetle and Scarab urea moulding powders. Also shown were glass fibre/polyester laminated plastics in various forms. The fair was visited by several members of B.I.P.'s staff, including Mr. Harold Brooks, Mr. Charles Cathro, Mr. L. A. Saunders and Mr. J. Butler. The last mentioned read a paper entitled "Mould Design and Moulding Techniques." The B.I.P. stand was organized in conjunction with the company's Dutch agent, Merrem and La Porte N.V.



B.I.P. Chemicals Stand at Utrecht Fair.

BRITISH PLASTICS FEDERATION, 20th ANNUAL LUNCHEON, APRIL 26.—The Duke of Edinburgh will be the guest of honour at this luncheon. Mr. Arthur Skan (Birmingham), chairman of the Federation, will preside and will speak. He will be followed by Sir Graham Hayman, president-elect—and by the time of the luncheon, president—of the Federation of British Industries.

DR. W. E. de B. DIAMOND, director of the British Plastics Federation, presented a paper, "Plastics Materials and Their Economic Influence in Great Britain," at the Third International Plastics Congress of the Society of Chemical Industry, in Paris.

"Plastics in the Service of Man"

The following is a list of full names and addresses of companies mentioned in the illustrated feature, "Plastics in the Service of Man," which appears on pages 108 to 110 in this issue:—

56. Plastics in the Brewery and Distilling Industry—1

B.X. Plastics, Ltd., Higham Station Avenue, Chingford, London, E.4.
Bakelite—Bakelite, Ltd., 12-18 Grosvenor Gardens, London, S.W.1.
British Rawhide Belting Co., Ltd., 246 Gt. Portland Street, London, W.1.
Courage & Co., Ltd., Horselydown, London, S.E.1.
Crystalate, Ltd., Mill Lane, Tonbridge, Kent.
Delmore, Ltd., 404-406 Chiswick High Road, London, W.4.
Formica—Thos. De La Rue & Co., Ltd., 84-86 Regent Street, London, W.1.
Gravfil Machines, Ltd., 88 Gray's Inn Road, London, W.C.1.
Ind Coope & Allsopp, Ltd., Burton-on-Trent.
J. F. Kenure, Ltd., Faggs Road, Feltham, Middlesex.
Perspex—I.C.I., Ltd., Plastics Division, Welwyn Garden City, Herts.
Precision Products (Leeds), Ltd., 143-5 Ellands Road, Leeds, 11.
Runcolite, Ltd., 3 Vere Street, Oxford Street, London, W.1.
Thermo-Plastics, Ltd., Luton Road Works, Dunstable, Beds.
Universal Metal Products, Ltd., Langley Road, Salford 6, Lancs.
Warerite—Warerite, Ltd., Watton Road, Ware, Herts.
Watney Combe Reid & Co., Ltd., Allington Street, Pimlico, London S.W.1.

MEETINGS

April

15th.—"Maintenance of Thermosetting Plant," J. A. McConville, A.M.I., Prod. E. Plastics Institute, Midlands Section, James Watt Institute, Great Charles Street, Birmingham. 6.30 p.m.

19th.—23rd Annual General Meeting, Society of Chemical Industry, Plastics and Polymer Group. Followed by "Some Properties of Crystalline Unsaturated Polyesters," F. Schollick; "Some General Principles Involved in Polyester Resin Manufacture," L. H. Vaughan; "Curing Properties of Polyesters," B. S. Parkyn. Rooms of the Chemical Society, Burlington House, Piccadilly, London, W.1.

20th.—Annual General Meeting and Smoker. Plastics Institute, Scottish Section.

20th.—"Silicones," C. B. Ingram, B.Sc. Plastics Institute, North-Eastern Section, Oak Room of Mining Institute, Neville Hall, Newcastle upon Tyne. 7.0 p.m.

20th.—"Vacuum Evaporation Plant for Metallizing Volatile Plastics Materials," L. Holland. Plastics Institute, Yorkshire Section, St. Mark's House, 186 Woodhouse Lane, Leeds. 7 p.m.

22nd.—"Colouring of P.V.C.," C. Musgrave, A.M.C.T. Plastics Institute, North-Western Section, Engineers' Club, Albert Square, Manchester. 6.30 p.m.

25th.—Annual General Meeting and Chairman's Lecture, Plastics Institute, London Section, Waldorf Hotel, Aldwych, London, W.C.2. 6.30 p.m.

25th.—Annual Luncheon, Plastics Institute, Midlands Section, Queen's Hotel, Birmingham.

27th.—Works Visit to the Steel Company of Wales, Abbey Works, Port Talbot. Plastics Institute, South Wales and Monmouthshire Section. 2.30 p.m.

May

5th.—Annual General Meeting. Plastics Institute, Southern Section, Polygon Hotel, Southampton. 7.30 p.m.

11th.—Annual General Meeting. Plastics Institute, South Wales and Monmouthshire Section, Royal Hotel, Cardiff. 7.0 p.m.

TALKING SHOP . . .

Irradiated Plastics. On March 8, Dr. A. Charlesby, now well known to the plastics industry as the specialist on irradiated materials, read an excellent paper to a joint meeting of the London Section of the Plastics Institute and the London Section of the Institution of Rubber Industry.

Dr. Charlesby defined progress in this field at the moment as falling into three distinct divisions; the first embraces the study of high polymers by means of irradiation techniques. The second, the study of effect of irradiation upon living beings. The third, the use of irradiated materials in radio biology.

Each of these fields offers immense horizons for the chemist; for the plastics industry we are concerned most intimately with the first, the study of high polymers. Largely because of mathematical calculations based on the effects of irradiation upon polythene, the time is coming when the evaluation of polymer structures, indeed even analysis, may be most speedily arrived at by irradiation, either with the aid of direct exposure to protons and neutrons or by gamma rays or X-rays.

All this, of course, is complementary to the first result of irradiating polythene, the cross-linking of a polymer to give essentially a thermoset product having a higher softening point. It is impossible to forecast how quickly irradiated material will be available commercially in Britain, although it is now possible in the United States to purchase supplies of irradiated polythene rod. A subsequent step would, presumably, be a commercial service; in effect, irradiating mouldings required by customers.

One thing is certain, the exploratory work carried out by Dr. Charlesby and his colleagues at Harwell will certainly stimulate further investigation, not only by the Atomic Energy Authority but by university and industrial bodies. This will no doubt be closely linked with the resources of the atomic power stations, the construction plans of which were recently announced by the Government.

* * *

Plastics and Railways. An interesting booklet has just been published by I.C.I. entitled "I.C.I. Products for Railways." This has special interest at the moment in view of the vast railway modernizing programme discussed on this page last month. Plastics materials have received special mention in this booklet under the headings of electrical insulation and rolling stock.

* * *

E. I. du Pont de Nemours and Company. At 12 noon on Monday, April 11, the annual meeting of the stockholders of E. I. du Pont de Nemours and Company was held at Wilmington, Delaware, U.S.A. A massive organization, du Pont has been a name to conjure with since the birth of the plastics industry. Measured in money, the company's sales reached $1,688m. in 1954, and a copy of the annual report which has just reached me includes a directory of products. They include electro-chemicals, explosives, fabrics and finishes, films, organic chemicals, pigments, plastics and textile fibres. In the plastics field, products include urea, acrylics, polythene, acetate, nylon and polytetrafluorethylene. Dr. Carothers spent a large part of his working life in the laboratories at du Pont working in the superpolyamide field, and one of the fruits of his labours was nylon.

* * *

Conveyor Belting for the Mines. Rubber Improvement, Ltd., of Wellingborough, Northants, held a party at the factory on March 25 to celebrate the production of the millionth foot of the Leonex-Green for Safety conveyor belting. The function was well attended by officials of the National Coal Board, the National Union of Mineworkers, and other bodies. Mr. John Lewis, the chairman and development director, welcomed the guests, who were taken on a conducted tour around the plant. The manufacture of this safety belting was described on pages 387 to 389 of the December, 1954, issue of *Plastics*.

* * *

Cocktail Party. In March we were the guests of Ranton and Co., Ltd., at the annual party for their friends at Londonderry House. The gathering was extremely well attended by the company's friends in industry, who were welcomed by Mr. T. G. Brooke-Hitching, managing director.

* * *

Krupp Expanding Exports. A note in the *Birmingham Post* for March 28 records a comment by Herr Alfred Krupp recently. Speaking of his company's overseas markets, he said that in Germany Krupp's were now going into the plastics industry. It will be interesting to see which branch of the industry he proposes to exploit; certainly we can expect it to be on a large scale. Krupp's turnover in 1954 was about £85 million.

* * *

Sprayable Foam Insulation. Without revealing its chemical nature, a note in *Chemical and Engineering News* (March 7) reports a foam insulation material. It can be sprayed like paint, and within 15 minutes of application expands to twenty times its original thickness. At the same time the character of the material changes from that of a thick varnish to a semi-rigid insulation. The high temperature limit of the material is said to be about 106° C. The report states that before spraying, two liquids must be blended to exact proportions and heated to a certain temperature, requiring special apparatus. This might indicate a polyurethane type of material. The process has been introduced in America by the Insul-Mastic Corporation.

A Market for Plastics. A note in the *Bristol Evening Post* for January 12 gives some information on British Railways requirements for cups, for use in station waiting-rooms and on buffet cars. Required is a cup that will be stronger than the conventional china and which will not stain. An average of 10,000 cups is estimated to be broken, lost or stolen every day.

* * *

Plastics Instead of Copper. On March 7, the *Birmingham Post* published an important article on the challenge to the non-ferrous trade by the plastics industry. The *Post's* correspondent notes the long-term threat to the valuable trade in copper water pipes, resulting from the high price of copper (£341 a ton), and the resourcefulness of the plastics industry in producing flexible water pipes. Although the plastic pipes have by no means a clear field, none the less several firms dealing in non-ferrous metals are reported to be experimenting in the use of the rival materials.

The concern of the industry over the substitution is such that a special committee of the International Wrought Non-Ferrous Metals Council has investigated the problem. The following extract is taken from the Council's report: "It is calculated that permanent substitution of wrought copper and copper alloys is equivalent to some 10 to 15% of present production, but substitution is a continuing process, and the spectacular developments of the plastic and aluminium industries, together with the great improvements in the ferrous industry, will present a constant challenge."

* * *

British Standard for Plastics Trays. British Standard 2581:1955, Plastics Trays, has now been published. This covers all trays used for the conveying, serving or displaying of food, conveying or storing goods during and after manufacture and for normal household usage excluding purely decorative uses.

Very stringent tests for the quality of material used, workmanship, fittings and finish, resistance to breaking, chipping and heat and also stipulations regarding toxicity and rigidity are specified. These tests must be performed before the B.S.I. mark may be applied to plastics trays. All trays which pass these tests will now have the B.S.I. mark No. 2581:1955 permanently embodied in their surface so that purchasers can be sure that they conform to the British Standard.

While trays used for purposes which would subject them to exceptionally high temperatures or contact with strong chemicals are not covered by the Standard, tests for heat resistance are so severe that any tray passing them is sure of a long life if treated normally.

Furthermore, this British Standard will assist the designer of trays and enable him to select the correct type of material to be used and will help him to design a specific tray to give it maximum strength. In this way it is hoped to avoid misapplication of materials and ensure that a satisfactory article is produced. PLASTIKON.

The Properties and Testing of Plastics Materials—Part 2.

Section I. Tensile Strength, Elongation and Modulus

By A. E. LEVER,* A.I.R.I., and J. RHYS,† M.Sc.

This, the second part of a series on the properties and testing of plastics materials, commences a detailed treatment of mechanical properties. Tensile strength, elongation and modulus are dealt with, information being given on test methods, together with literature references. The table at the end of the article summarizes test results for these three properties over a wide range of plastics, and as such will be of special value for comparative purposes.

Introduction

IT is essential to define one's terms in this case to avoid confusion with the use of words conveying different meanings.

Stress[1] is the intensity (measured per unit area) of the internal distributed forces, or components of force, which resist a change in the form of a body. It is measured in p.s.i. or kg./sq. mm.

There are three kinds of stress, viz., tensile, compressive and shearing.

Flexure involves the combination of tensile stress and compressive stress. Torsion involves shearing stress.

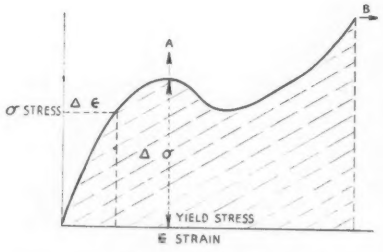
It is customary to calculate stress on the original dimensions of the cross-section of the body.

Strain is the change per unit of length in a linear dimension of a body, which change accompanies a stress. It is measured in inches per inch of length (mm./mm.) or in per cent.

Under tensile stress or compressive stress, strain is measured along the dimension under consideration. Shearing strain is measured at right-angles to the dimensions under consideration. It is usually described as "elongation."

Modulus, as used in the rubber industry, should not be confused with modulus of elasticity which is the ratio of stress to strain produced by that stress. The word modulus is applied in the rubber industry when a tensile stress at a certain strain is indicated, e.g., 1,800 p.s.i. stress at 150% strain would be expressed as a "Modulus of 1,800 p.s.i. at 150% elongation."

Tensile strength is the maximum tensile stress which a material is capable of developing. It is calculated from the maximum load carried during a tension test and the original cross-sectional area of the specimen.



Stress-strain curve.

* Consultant. † Senior Lecturer in Plastics, National College of Rubber Technology.

Tension strength has a similar meaning.

There is a comprehensive definition of terms dealing with tensile properties in the American Specification.[24]

The stress-strain curve of nearly any plastic material, at equilibrium with any environment, can be represented by a curve of the general form[2] shown in the graph.

The slope of the curve, where stress and strain are more or less proportional, is a measure of the stiffness or rigidity. The ratio of stress to strain $\left(\frac{\Delta\xi}{\Delta\sigma}\right)$ in this region is known as Modulus of Elasticity or Young's Modulus.

The stress at the first bend in the curve (A) is the "Yield Point," and is a measure of the strength of the material and of its resistance to permanent deformation. Strains in those portions of the curve before this point are largely recoverable and are a measure of elastic deformation.

Beyond this point (A) to the breaking point (B) the strain is not immediately recoverable, and is a measure of plastic deformation.

The area under the curve, which represents the work required to fracture the test piece, is a rough measure of toughness.

In general, materials that are:—

(a) Soft, weak—show low modulus of elasticity, yield point, and low elongation at break.
(b) Hard, brittle—high modulus of elasticity, no well-defined yield point and low strain at break.
(c) Soft, tough—low modulus of elasticity, low yield point and high strain at break.
(d) Hard, strong—high modulus of elasticity, yield point and moderate stress and strain at break.
(e) Hard, tough—high modulus of elasticity, yield point, stress and strain at break.

Tension tests, properly interpreted, provide reasonably accurate information regarding tensile properties of plastics when employed under the conditions under which the tests are made.[3] The tests cannot be considered significant for applications differing widely from the load-time scale of the standard test. Such applications require other more suitable tests, e.g., impact, creep, fatigue tests, etc.

Types of Apparatus

The Universal Plastics Testing Machine is described[4], and is capable of having unusual speeds, travel and control, to cover properties of plastics materials with their sensitivity to time rates, ambient atmospheric conditions, speed of testing, etc.

The Baldwin Universal Testing Machine[6] and the **Dillon Universal Tester**[56] are also described.

The Scott Inclined Plane Test Machine[7 12] is used for determining the tensile strength of coating films, which are prepared by coating on tin-plated panels and then removed by placing on a bath of mercury. The tin is amalgamated on contact with the mercury, assumes the liquid state, and thus permits the film to separate and float on the bath. Alkyd, nitrocellulose, and polyvinyl-chloride-acetate were investigated.

The Bailey Unmoulding Stress Tester is described.[8] This was used for the study of biaxilly orientated methacrylate and polystyrene sheet. It is used to indicate toughness and this investigation showed that biaxilly orientated sheet had greater resistance to weathering than unorientated sheet.

Included in a full discussion on tensile testing[9] is a description of the **Hounsfield Tension Tester** and the **Bureau of Standards Strain Tester.** The former[10] is capable of pulling test pieces from bar material, plastics, textiles and films. It also provides for tests such as notched bar, shear, compression and indentor.

An **Extensometer,** which is a device for measuring strain, either of the indicating or recording type, can be provided for the Hounsfield Tester, for determining the proof stress, elastic limit or Young's Modulus, of a material which is being loaded in the machine. It can also be used with other types of tensile testing machines.

Other well-known types of apparatus noted below are briefly described and illustrated[11]:—**Tinius Olsen, Scott Testing Machine, Schopper Testing Machine, The Instron Testing Machine,** in which electronic systems are used for measuring the load and for controlling the extension.[11a]

Modulus tests of vulcanized rubber are described[12] using the **Scott ORRL-6 Tester.** The influence of temperature and humidity was investigated.

It is suggested[13] that the evaluation of plastic films by the simple measurement of tensile strength and elongation by conventional methods is inadequate. Various testing machines are compared, and it is concluded that those utilizing dynamometer systems involving negligible movement of the upper jaw will find an increasing field of usefulness.

A new instrument is described[14] by which the plastic-elastic behaviour of rubbery high

polymers can be measured by means of forced vibrations under extension stress.

A device is offered with the **Goodbrand Testing Machine**[15] which permits the autographic recording on paper of the stress-strain properties in tension of a standard rubber dumb-bell shaped test piece.

An electrical extensometer for determining the elongation of elastomers[16] can be installed on the Scott Tester. It is used to record automatically, and accurately, the elongation of the reduced section of the specimen throughout the test. It has been used successfully with materials ranging from soft to very hard.

Details are given[17] of an apparatus for tension measurements while the specimen (elastomers) is partially swollen by a selected liquid.

An apparatus for measuring the relationship of temperature of Young's Modulus from −60° C. to +40° C. is essentially an analytical balance arranged to apply an increasing load up to 40gm., to the centre of a test specimen supported at each end.[18] The deflection is measured and the test is non-destructive.

The variation of Young's Modulus with temperature, for any given plastic material, is useful in evaluating the suitability of materials for special applications.[18] A laboratory apparatus is described for the purpose and data on some results given.

An apparatus for measuring the modulus of a rubber vulcanizate is described[19] and is a modified E.T.A. triple-beam laboratory balance. The extension rod carries a grip B of the type used in the B.R.P.R.A. strain tester.[20]

Test Pieces

The precision in making test pieces can have a very great effect on the results, and the secret of making satisfactory pieces is to use an instrument-shop technique rather than a machine-shop technique.[21]

For elastomers, either a ring or dumb-bell type test piece is used, but for plastics generally the latter is usual.

A broad survey of the fundamental factors affecting the production of representative test pieces designed for the investigation of the mechanical properties of mouldings in thermosetting resins is given[22], and a new type of test piece is proposed.[23]

Moulded or machined dumb-bell test pieces are used in American Specifications[24] but they are not suitable for thin sheet, film or elastomers.

For thin sheet and film, two methods are given[25] using strip test pieces:—(a) with constant rate of loading, (b) with constant rate of separation of jaws.

If anisotropy is suspected, tests are to be made with specimens having their long axes respectively parallel with and normal to the suspected direction of anisotropy, i.e. longitudinal and transverse.[26]

For moulded electrical insulating materials moulded dumb-bell test pieces are used.[27]

Inaccuracies of stress-strain data in testing elastomers are increased by variations in the width of the narrow portion of the dumb-bell test piece.[28] A method for more precise determination of the width, based on specific gravity, is suggested.

For tensile testing of p.v.c. sheet, the British Specification[29] dumb-bell test pieces are used. The load range of the machine used must be such that the breaking load of the test piece falls between 15% and 85% of the maximum on the scale.

A specimen moulded in a positive mould is used for phenolic resins[30], with a pressure of 1-2 tons p.s.i., and mould temperature 149° to 165° C. for 15 minutes. Dimensions of the test piece are given and also details of the holder. Any tensile testing machine may be used provided the load at fracture may be measured to an accuracy of 1%. Calculations are made from the original cross-section area.

Strain Gauges

In recent years, several investigations have been carried out to determine the plastic stress-strain relations for materials subjected to combined stresses.

One report[31] describes two strain gauges for measuring strains on tubular specimens subjected to combined stresses. One is a tension-torsion gauge and the other a tension-tension gauge.

There is a review of electrical strain gauges[32] and both a theoretical and practical treatment of various methods of using these gauges.[33]

Investigations are reported[34] on stress-strain data of laminates using the **Tucheman Strain Gauge** for the first 0.5% strain.[35] It is suggested that the use of "proportional limit" is of doubtful value owing to the effect of several variables, and for laminates such as those tested, the stress-strain diagram is not linear.

General

For cellulose acetate moulding materials dumb-bell test pieces are used in the British Specification.[36]

Determining tensile properties is covered in the American Specification[37], and springs for the calibration of tensile testing machines are described.[38]

There are details of a positive self-closing grip for holding dumb-bell test pieces.[39]

A calibrated spring is used[40] to measure the stress in a rubber specimen at intervals after the imposition of a fixed strain. To work at high or low temperatures a vacuum flask container is used to surround the specimen and retain it at a fixed temperature while the measurement is being made during a brief period of removal from an oven or refrigerator.

In [41] there is an informative chapter on the static strength of plastic materials, including a good bibliography. Tensile strength and other properties are discussed.

The stress-cracking of polythene has been investigated[42] and a description of the apparatus is given. It is observed that at high strains, just before failure, this region is affected by the geometry of the specimen, and the technique of testing and the stress-strain curves are of doubtful validity. The localization of strain (necking) renders measurements between gauge marks meaningless.

There is an interesting discussion[43] of the use of rubber models, cut from rubber sheet, to investigate stresses around holes in flat sheet under tension.

In order to measure precisely the elastic properties of polymers which are too soft to test on a conventional testing machine, a constant-stress method of strain was developed.[44] This is achieved by employing a tension weight in the shape of a hyperboloid. As the film stretches, the weight is lowered into a liquid, and buoyancy reduces the load in proportion to the decrease in cross-sectional area of the specimen. The variation of modulus with time is determined. The accuracy is such that the effect of small changes in formulation can be detected.

A table of tensile strength at elevated temperatures for various resin-bonded materials used in aircraft and guided missiles is given.[45] Glass-fibre laminates must often sustain appreciable loads over relatively long periods of time. A relation has been worked out which allows the use of short-time tests at elevated temperatures to determine long-time data at room temperature.[58]

Speed of Testing

It should be noted that the "Speed of Testing" is the velocity of separation of the two grips (in tensile testing) of the tensile machine when running idle, i.e. with no load.

There is a valuable resumé and discussion of the literature on this subject[46], and data for specific plastics.[57]

Data is presented showing that in many plastics, the stress-strain behaviour varies with the rate of straining, and similar effects are produced with other strength properties.

Attention is called to the differences observed when plotting tensile stresses by dividing the tensile load by the actual cross-section area at the time the load acts (true stress) and the ordinary method obtained by dividing the load by the original cross-section area (ordinary stress). When the strains are small the differences are small, but when they are large the differences are marked.

In plastics, where the effect of rate of strain has a marked influence upon the stress-strain relationship some differences in behaviour will occur, depending upon whether the test is conducted at controlled rates of ordinary strain or controlled rates of true strain.

High stresses of short duration are produced in aircraft, and a report[47] investigates the rate of loading and the stress-strain characteristics of some materials.

Glass fibre polyester laminates, polymethyl methacrylate and phenolic laminates were used, and it was concluded that, yield strength, ultimate strength and modulus of elasticity increased over the range of rates of loading used in different degree according to the material:—

Increase in Yield Strength, Ultimate Strength, and Modulus of Elasticity, per cent.

	Increase Per Cent			
	P.M.M.	Cotton based laminate	Glass fibre laminate	Aluminium Alloys
Yield Strength ...	100	45	15	Slight
Ultimate Strength	100	30	25	do.
Mod. of Elasticity	100	20	No change	do.

Other published data[48] reveal that the speed of testing fatigue does not seriously affect the fatigue strength, provided the temperature effects can be eliminated.

Rapid tests indicate the elastic characteristics and slow tests the viscous behaviour.[49]

Using a Hounsfield Tensometer mechanically driven[50] it was shown that the modulus of elasticity for nitrocellulose is independent of head speed, but for vinyl plastics there is a tendency to increase slightly with increasing speed.

Brief notes on the effect of varying the speed in determining tensile strength are given[11] and various papers on the speed of testing are reviewed.[51]

The effect of rate of extension on the tensile behaviour of viscose, acetate rayons, silk and nylon is discussed.[52] A description is given of two instruments used for recording the load-extension curves of yarns at constant rates of extension from 0.001% to 1,000%. It is shown that at any given extension, the stress is higher the higher the rate of extension.

Creep is thought to be related to the observed decrease in tensile strength with decreasing rate of load application.[53]

A recent investigation[54] showed no crazing in polystyrene at a stress below 800 p.s.i. at room temperature and that its long-time breaking strength is about 2,500 p.s.i. (c.f. values reported in the literature of approx. 7,500 p.s.i.). There is a sound basis for classifying tests according to speed of testing, and some specifications include a clause requiring the speed of the separation of the grips holding the test piece to be at a certain rate, to meet this requirement.

In an American Specification[25] dealing with thin plastic sheets two speeds of crosshead are required:—(a) where the ultimate elongation of film is less than 100%—2 in. per minute, (b) where the ultimate elongation is over 100%—20 in. per minute.

A device for controlling the rate of straining in the specimen is described.[4]

Young's Modulus

The normal tensile test specimen and apparatus is also used for the determination of Young's Modulus.

For rigid plastics it is necessary to have a sensitive micrometer instrument attached to the specimen. By adjusting the load on the specimen, and taking readings on the micrometer, the behaviour of the specimen under test can be plotted, and the various elastic properties calculated.

Some data on the relationship between temperature and Young's Modulus for plastics are given.[55]

The elastic modulus can be calculated by producing the initial linear portion of the stress-strain curve, selecting any point on this straight line, and dividing the tensile stress represented by the point, by the corresponding strain.[24]

Films and sheets of elastomeric materials may have no discernible straight line portion of the stress-strain curve. Elastic modulus for these materials is usually defined as the stress divided by strain at 100% elongation.[25]

Mechanical Properties of Plastics—Tensile Strength, Elongation, and Modulus of Elasticity

MATERIALS	Tensile strength psi × 10^3	Elongation at break	Young's modulus in tension psi × 10^5
		%	
Phenol formaldehyde Type G	8.0	1.0–1.5	9.0
Phenol formaldehyde Type MS	7.0	0.5	10.0
Phenol formaldehyde Type HS	6.0	0.5	12.0
Phenol formaldehyde Type HR	4.0	0.5	12.0
Phenol formaldehyde laminates—paper	6.0–20.0	—	4.0–20.0
Phenol formaldehyde laminates—fabric	9.0–16.0	—	3.0–12.0
Cast phenolics	7.0	1.5	8.0
Urea formaldehyde—paper filled	6.0	—	10.0
Urea formaldehyde—wood filled	7.0	—	10.0
Urea formaldehyde laminates—paper	10.0–20.0	0.5–1.0	10.0–12.0
Urea formaldehyde laminates—fabric	9.0–13.0	0.5–1.0	10.0
Melamine formaldehyde	8.0	0.5	12.0
Melamine formaldehyde laminates—paper	10.0–20.0	—	10.0–12.0
Melamine formaldehyde laminates—fabric	9.0–13.0	—	10.0
Polyesters—unfilled	6.0	5.0–300.0	3.0
Polyester glass laminate—rovings	100.0	—	60.0
Polyester glass laminate—cloth	40.0	—	30.0
Polyester glass laminate—mat	25.0	—	20.0
Cellulose nitrate	7.0	40.0–45.0	2.0
Cellulose acetate	6.0	10 0–60.0	2.0
Cellulose acetate—butyrate	4.0	40.0–80.0	3.0
Ethyl cellulose	6.0	5.0–40.0	2.0
Polyethylene	1.8	550.0	0.2
Polytetrafluorethylene	2.0	100.0	0.5
Polyvinyl chloride—p.v.c.—rigid	7.0	5.0	5.0
Polyvinyl chloride—p.v.c.—plasticized	2.0–3.0	200.0–400.0	—
Polyvinyl chloride—acetate—rigid	6.0	5.0	4.0
Polyvinyl chloride—acetate—plasticized	1.0–3.0	200.0–350.0	—
Polyvinylidene-chloride	4.0	200.0	0.6
Polystyrene	7.0	3.0	5.0
Polystyrene (and alloys)—high impact	8.0	To 90	3.0
Polymethyl methacrylate	8.0	5.0	4.0
Nylon moulding powder	9.0	90.0	3.5
Nylon filaments	50.0	22.0	6.0
Silicones (elastomeric)	0.2–0.8	100.0–300.0	—
Natural rubber—vulcanized	1.0–5.0	300.0–900.0	—
Hard rubber—ebonite	7.0	3.0	4.0
Shellac	1.0	—	—
Casein	10.0	2.5	—
Steel	100.0	0.1	300.0
Aluminium	25.0	—	1.0–4.0

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Modern Steels for Plastic Moulds and Hobs

By R. GROVES

Progress in metallurgical research has led to significant improvements in steels for moulds and hobs. The author reviews here these developments and includes tables to show typical steel compositions.

A GOOD deal of research and experiment continues to be carried out into the proper materials for moulds and hobs in the making of plastic products. Most of the moulding of these materials is carried out at elevated temperatures, and the size and finished appearance of the eventual product are controlled by the condition of the finished surfaces of the mould. In consequence, it is essential that these should be clean, present no difficulty in production, possess a high degree of abrasion resistance, and withstand distortion in heat-treatment.

Heavy pressures are often used, ranging from 3,000 to 12,000 lb. per sq. in., while the temperatures may range from 350 to 400° F. (or 176 to 204° C.). Certain specific requirements are a hard surface and a tough core, so that the steel may resist the shock and bending moment encountered when direct compression moulding and other processes are used. It is by no means uncommon for hand-operated moulds made up of a number of separate parts to be roughly treated when being put together or when ejection of the finished moulding takes place. If the steel used were lacking in hardness, serious damage might be caused.

Another requirement is a high degree of resistance to corrosion, which is specially necessary when the moulding powders employed have a urea or thio-urea base. To produce the essential shining surface on some mouldings, the finished moulds may have to have a high polish, or at least be capable of taking such a polish. This is sometimes achieved by hard chromium plating, but there is no general insistence on the use of this.

The impressions of dies are frequently made by one of two processes, or a combination of both. One is hobbing and the other machining, which may be necessary in some instances. In hobbing, the die impression is made by forcing a master hob into the steel while in the cold state, which may involve a number of separate stages, with intermediate softenings or annealings of the steel. It is the most economical process where a range of moulds of identical design are required, as long as the impression to be formed is suitable.

Machinability

In choosing steel for moulds, the first requirement is machinability, which necessitates a steel lying within the range of 150-250 Brinell. The mould when completed should possess a superficial hardness ranging from 58 to 60 Rockwell C or 750 to 753 Vickers Diamond. This hard surface should extend at least 0.02 in. into the interior, and should then decline gradually towards the core, which should have a hardness of about 500 V.D.H. In some instances a steel of oil-hardening or air-hardening type may be preferred, in which case the superficial hardness should be 47 to 50 Rockwell C or about 500 to 540 Vickers Diamond.

The tensile strength of the core should range from 70 to 100 tons per sq. in., and the impact value should be at a maximum.

The surface of the steel may be greatly impaired if there are internal defects, so that stringent tests must be carried out before the steel is accepted. Internal defects are always liable, when working pressures and temperatures come into play, to open up and cause blemishes on the mould surface.

Annealing

The annealing operation required to soften the steel must be easy to carry out so that whenever necessary changes in the design of moulds can be readily made. The depth to which a hob can be forced is mainly governed by the hardness of the steel after annealing, and this in turn depends on the kind of steel used. Carbon steels can be made softer than alloy steels of identical carbon content. The strongest moulds are, therefore, made from the more difficult materials, as far as hobbing is concerned.

If the dies are for long runs, wear-resistance will be an important requirement, and a higher carbon and alloy content usually means greater resistance to abrasion. Dies with thin sections and those of large size need to be extremely strong, to prevent the sinking-in of areas under the combined effects of heat and pressure.

The heat-treatment of the steels is important and is designed to give the properties required in each individual instance. Each steel has its own best form of heat-treatment, and the operator's great need is to prevent distortion or ensure that it is as little as possible in extent. The mould must be accurate or else the tolerance on the finished moulding will be taken up by uneven shrinkage of the moulding as it cools after being cured.

Before giving tables of the most suitable steels for plastics, it may be advisable to point out that the closer the dies and hobs can be brought to finished dimensions without grinding or machining, the more economical they become. Grinding and machining to size and shape are important items of cost. Typical steps that may be taken to reduce these costs include use of a controlled atmosphere furnace in heat-treatment to prevent oxidation of the surface, selective hardening, case carburizing and sometimes hardening by salt bath. The choice of suitable non-distorting alloy steels and the stress-relieving treatment after machining are all useful in this connection. In quenching, care must be taken to avoid local softening. Should the steel be one liable to become brittle when tempered, it should not be heated for tempering within the range 200-400° C.

Mould Steels

The steels for moulds are shown in Table 1. These may be grouped into (a) nickel-chromium and nickel-chromium-molybdenum steels, suitable for either direct oil-hardening or cyanide-hardening, and (b) a high carbon, high chromium die steel which may be directly hardened in oil or air. The nickel-chromium or nickel-chromium-molybdenum mould steels are mainly employed because they are reasonably hard even after being annealed, are readily machined, and fulfil most of the requirements of a good mould steel.

Note 1.—If the first two steels are not case-carburized, they should be oil-quenched or air-hardened at 830° C.

Note 2.—The hardnesses of these four steels are as follows: Nos. 1 and 2, C.58-60 if carburized; C.44-49 if not. Nos. 3 and 4, C.25-33.

The high carbon, high chromium die steels used for moulds have the general composition; carbon, 1.3 to 2.5 per cent.; manganese 0.2 to 0.4 per cent.; silicon, 0.2 to 0.4 per cent.; chromium, 12.0 to 14 per cent.; molybdenum, 0.3 to 0.5 per cent.

The first two steels of Table 1 are more commonly employed than any others for moulds of thermosetting and thermoplastic type because of the wide range of heat-treatment they may undergo. Carburizing is adopted whenever maximum abrasion resistance is required or where the steel must be in a condition to resist injury of an accidental type. The steels should be hardened after case-carburizing. The use of oil or air for hardening depends mainly on what is required.

In hobbing moulds, care should be taken to avoid those of intricate form, which are unsuitable. Multiple cavity moulds are mostly made by this process as long as the

TABLE I.

Composition %						Heat Treatment deg. C.			
Carbon	Mang.	Silicon	Cr.	V.	Ni.	Anni.	Carbur.	Hdn.	Tempering
0.34-0.38	0.5	0.3 max.	0.75	—	3.5	650	880-900	780	200-240
"	0.6		1.50		4.0		See Note 1		
		Molybdenum 0.3 optional					See Note 1		200-240
0.5	0.6	0.3 max.	0.60	0.10	—	850	850		500
0.6	0.7	0.3 max.	0.80	0.15		850	850		600

TABLE 2.

Composition %					Heat Treatment °C.			
C.	Mn.	Si.	Cr.	Ni.	Annl.	Carbur. deg.	Hdn.	Tempering
0.08-0.12	0.20	0.10	0.50	1.4	650	880-900	830 Oil.	200-240
0.8-0.12	0.40	0.30	0.75	1.8	650	850-900	830 Oil.	200-240
0.08-0.12	0.15	0.10	—	—	880	900	780 Water	180
0.8-0.12	0.30	0.30	—	—	880	900	Water	180

contours are readily and accurately reproducible. Typical examples include lettering and accurately spaced scale divisions, as on radio control knobs. The hobbing process can also be employed for button moulds and moulds for the caps of bottles.

The pressures required to drive a hob into the mould steel range from 100 to 200 tons per sq. in., and a master hob for this work must, therefore, possess a close grain structure, a high degree of strength and also excellent resistance to wear, while both hob and work must have a high polish. The steels suitable for hobs are shown in Table 2, and it is essential that any steel for this purpose should have excellent plasticity, freedom from tearing, and absolute cleanliness, without inclusions. The moulds are always case-carburized.

It is essential to case-carburize all these steels for hobbed moulds. The first two steels of Table 2 are more difficult to hob than the others, but can be hardened in oil with a consequent smaller risk of distortion. These steels should give a Rockwell hardness of C.58 to 60, and the last two, a Rockwell hardness of C.60 to 62.

Master hobs are always made of high carbon, high chromium steel, but if an alternative is required, a carbon tungsten steel may be used.

When we come to steels for hobs or direct cut moulds, the choice is usually made from the materials shown in Table 3.

TABLE 3.

Composition %							Heat Treatment °C.			
C.	Mn.	Si.	Cr.	W.	V.	Ni.	Annl.	Preht.	Hdn.	Tempering
2.2-2.4	0.35	0.40	12.5	—	opt. 1.0	—	850-900	800	950-980	230-270
2.2-2.4	0.35	0.50	13.5	—	opt. 1.0	—	850-900	800	950-980	230-270
0.85-0.95	1.4-1.8	0.3	opt.	opt. 0.50	opt. 0.15	—	760-790	600	760-790	200-230
0.95-0.35	0.30 max.	—	—	—	—	—	750	—	760-780	180-220
1.15 max.	0.30 max.	—	—	—	—	—	—	—	760-780 water.	180-220

The table (4) above gives the Brinell hardness of a number of steels that have been successfully hobbed. Some of these steels possess a fairly high hardness, and the parts that have been hobbed with them were relatively shallow, the hobbing being done by an expert.

The stainless chromium steel has been specially designed for use with urea moulding powders, and has also been used for insert button moulds and bottle cap moulds. It is not, however, fully resistant to corrosion in all circumstances, but can be used for most staining moulding powders. It should be case-carburized or cyanide-hardened before use. This steel also has the advantage that it provides a high degree of strength at the core after it has been hardened on the surface. It is usually supplied in a specially annealed condition, giving a Brinell hardness of 135 to 145.

Stress-relieving

Cold hobbing operations will set up internal stresses and strains in the steel. It is normally necessary and often advisable to remove these stresses and strains in advance of hardening the hob. If a good deal of metal is eliminated by machining, the resulting stresses are liable to distort the tool during hardening, so that wherever high dimensional accuracy is desired, a stress-relieving treatment should be given between the rough and finish machining operations.

TABLE 4.

Type of Steel	Brinell Hardness No.
Carbon case-carburizing	100
Nickel chromium	170
Stainless steel (chromium)	134

Such a treatment is usually carried out just below the critical temperature, i.e., from 600 to 720 deg. C., and is succeeded by a cooling of the steel in the furnace. Cooling in lime, ashes or the open air can be adopted, but there is invariably the risk that with swifter cooling extra stresses will be introduced by reason of the uneven temperature gradients caused throughout the work.

Injection moulds are often made of a high carbon, high chromium die steel because this steel can be hardened right through, has a close grain structure, and a high compressive strength, so that it does not sink under pressure at elevated temperatures, and it is also non-distorting. It is also a good steel to use for sliding pins. It accepts a high polish and has great resistance to wear. It is normally supplied fully annealed, in which condition it has a Brinell hardness of 230 to 250.

Some of the stainless mould steels can be used for manufacturing cut moulds for compression or injection moulding, but should not be used for hobbing.

Book Reviews

Handbook of Textile Fibres, edited by Milton Harris.

Published by Harris Research Laboratories, Inc., 1246 Taylor Street, N.W., Washington 11, D.C.

THE Harris Research Laboratories Inc., have published a valuable work on textile fibres. Included amongst the editorial staff who were responsible for its preparation, are Dr. Charles W. Hock, research chemist Hercules Powder Company, and Dr. John A. Howsmon, American Viscose Corporation.

The handbook is a result of an organized programme started ten years ago by the staff of the Harris Research Laboratories to compile and edit data which are of special importance to the research worker in the field of textiles. The immediate usefulness of such a compilation quickly suggested that the scope of the undertaking should be broadened and increase its utility not only for the research workers themselves but thus for all who have interest in the textile and related industries.

Comprising 356 pages, this handbook may almost be described as a monumental work; to the textile chemist and technologist it brings together information which was formerly scattered throughout a large number of textbooks and periodicals; to the plastics technologist the handbook makes a remarkable impact and the true contribution of plastics to the fibre industry is immediately apparent. A careful study of the book, however, reveals that the plastics industry itself is under a great debt of gratitude to many fibre chemists, most important of all, Dr. Carothers. The plastics technologist will also welcome the expansive information on properties of synthetic fibres.

The following chapter headings will indicate the comprehensive nature of the work: Textile Terms and Definitions, Fibre Types and Sources, Constitution and Structure of Textile Fibres, Chart of Fibre Properties, Physical Properties of Textile Fibres, Chemical Properties of Textile Fibres, Effect of Biological Agents, Identification of Textile Fibres, Yarn Numbering and Count Systems, Chemical and Engineering Tables, Economic and Production Data, List of Textile Periodicals.

The index, always a valuable guide to the true worth of a textbook of this nature, covers 18 pages and is exhaustive. For example, information on glass fibres is broken down under 28 sub-headings and these in turn lead to nearly 60 references within the pages of the book.

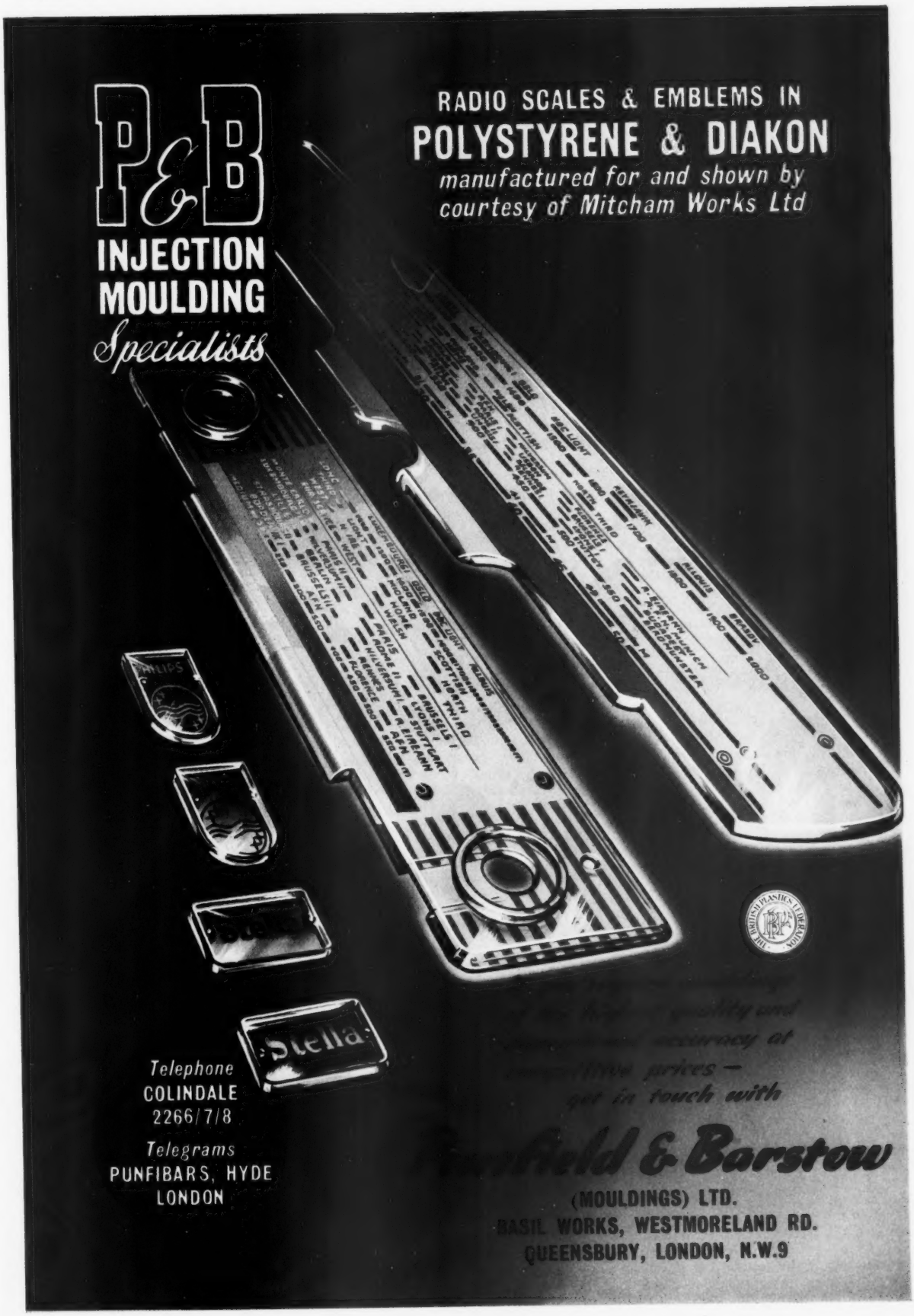
The many tables that are reproduced are adequately supplemented by explanatory footnotes, a valuable precaution where so many tests employed vary from material to material. A section of special interest, prepared by Dr. Howsmon, considers the X-ray diffraction characteristics of textile fibres and is illustrated with 52 photomichrographs.

To all workers in the synthetic field, this handbook will serve as a highly valuable source of reference.

British Plastics Yearbook, 1955.

Published by Iliffe and Sons, Ltd., Dorset House, Stamford Street, London, S.E.1, price 30s.

THE 1955 edition of this standard work has been extended and revised to 652 pages. Included are classified lists of manufacturers and suppliers of materials, finished products, and equipment. Other sections cover trade and proprietary names, a glossary of technical terms, a review of patents, and a list of new plastics companies registered during 1954.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PATENT REVIEW

The following abstracts have been made from specifications at the Patent Office, with the permission of the Controller of H.M. Stationery Office. The country of origin for Convention Applications is shown in parentheses. Complete specifications can be obtained from the Patent Office, 25, Southampton Buildings, London, W.C.2, price 2s. 8d. each (including postage).

B.P. 722,507. Manufacture of patterned thermoplastic strip material. G. Veit. To: Duratube and Wire, Ltd.

Hot thermoplastic material is passed through an extrusion orifice with passage portions of varying resistance to flow, so that parts are moving with greater speed while others are retarded. The result is an undulated product. Materials of different colours may be used with a plurality of orifices to obtain multi-coloured products.

B.P. 722,510. Laminated springs. A. Hodgson. To: J. Brockhouse and Co., Ltd.

Elements of a solid polymer of ethylene (polyethylene) are inserted as anti-friction cushions.

B.P. 722,531. Calendars and the like. To: Farrel-Birmingham Co. (U.S.A.).

For very thin plastic sheets and films requiring very heavy pressure.

B.P. 722,558. Slug traps. C. R. Churchill.

B.P. 722,573. Buckets or like receptacles having hoop-like handles. British Xylonite Co., Ltd.; E. H. Sharp.

The comparatively rigid plastic container has a pair of external sockets with slotted diaphragms resiliently receiving the ends of a hoop-like handle of relatively flexible material.

B.P. 722,576. Device for the application of liquid to flat surfaces. W. Hesselmann (Germany).

A polyethylene bottle with a screwed-on head having a rectangular discharge opening in a bevelled surface.

B.P. 722,591. Manufacture of tubular insulators for electric conductors. To: S.A. de Telecommunications.

A (polyethylene) tube is extruded and continuously shaped around the conductor during the hardening period between moving endless rubber belts with moulding bosses while the conductor is fed between the belts at the same linear speed. A gas pressure is maintained within the tube to ensure application against the bosses.

B.P. 722,601. Resinous compositions for the protection of materials and equipment sensitive to the action of water, moisture and mould growth. To: Soc. des Usines Chimiques Rhône-Poulenc (France).

Polyvinyl chloride, a refined anthracene oil, and at least one plasticizer for polyvinyl chloride as "tropical" package and for maintaining electrical insulation in unfavourable climatic conditions.

B.P. 722,612. Method of manufacturing articles from thermosetting materials. J. Rees. To: Bristol Aeroplane Co., Ltd.

Costly rubber bags, etc., for making certain tubular articles can be eliminated by using layers of asbestos sheets impregnated with uncured thermosetting resin on a former (interior of metal tube), coating the innermost exposed surface and the ends of all layers with paraffin wax and then liquid rubber latex, finally curing the resin by placing the assemblage in an autoclave under air pressure from within the tube.

B.P. 722,614. Optical projection screens. F. W. Whatling. To: Electric and Musical Industries, Ltd.

A sheet of methyl methacrylate of a thickness of 0.004 to 0.005 in. (3 ft. by 4 ft.) is heated under pressure over a former with a multiplicity of rectangular apertures or recesses so that the portions over the recesses are pressed into them. A multiplicity of concavities (convexities) are formed and remain in the cooled screen.

B.P. 722,620. Containers moulded from thermoplastic material. R. I. Johnson. To: Metal Box Co., Ltd.

The end portion of a thermoplastic tube is slit lengthwise and the slits caused partially to overlie one another. This portion is then deformed and shaped by heat between die and mandrel.

B.P. 722,628. Glass fibre filled alkyd resins. To: Allied Chemical and Dye Corp. (U.S.A.).

B.P. 722,638. Packages. N. T. Sanders. To: Needle Industries, Ltd.

"Tropical" packs for sewing needles are made up of polythene with a transparent window, a stiffener (paper) and a clip (metal).

B.P. 722,692. Wire mattresses. A. J. König. To: G. Kuperus, S. Kuperus, D. M. Borger (Twentsche Matrassenfabricken V/H Firma S. Kuperus).

The transverse members are made of thermosetting resin in which the ends of the network are embedded.

B.P. 722,719. Light-modifying mediums. J. T. Anderson, H. F. Ward, M. G. Clarke. To: British Thomson-Houston Co., Ltd.

A powdered transparent medium mixed with a liquid binder applied to a base. Base and binder are to be transparent to the rays to be utilized. Polymerized methacrylates or styrene may be used as binder.

B.P. 722,735. Ashtrays. I. Vinokour (Israel).

To prevent glowing cigarettes deposited on the rim dropping outside, thin ribs are arranged inside facing each groove on the rim.

B.P. 722,742. Preparation of moulds for use in metal foundry. To: Ford Motor Co., Ltd. (U.S.A.).

A mixture of refractory particles (silica sand) and a resin (phenol aldehyde type) is shaped between dies and cured so as to present an accurately formed exterior which can be backed by permanent supporting members. The mass may be introduced between the dies as a plastic sheet or may be injected.

B.P. 722,772. Terrestial globes for instructive purposes. P. Gasco.

Two moulded polystyrene hemispheres joined along their peripheral edges after the cartographic design has been affixed to their interior surfaces. The design may have been applied to a Cellophane sheet.

B.P. 722,799. Thermoplastic compositions. W. Saul, F. Sharp. To: Semtex, Ltd.

A polyvinyl compound with a liquid plasticizer sufficient to gel on heating is ground without heating to form a particulate dry powder. When spread on backing material and heated it yields glassy, hard, scratch-resistant surfaces.

B.P. 722,804. Surface coating. British Oxygen Co., F. P. Grimshaw.

Based on a phenol-formaldehyde resin to be applied to metals to give hard, flexible, adherent coatings.

B.P. 722,805. Adhesive compositions. British Oxygen Co., Ltd., F. P. Grimshaw.

A composition of a polyvinyl methyl ether or a polyvinyl ethyl ether in admixture with a phenol-formaldehyde condensation product.

B.P. 722,829. Polymerization products suitable for the insulation of metal articles. R. J. Zetie, W. Simpson. To: Metropolitan-Vickers Electrical Co., Ltd.

A polyhydric alcohol polyester, especially for the insulation of copper and copper alloys.

B.P. 722,830. Reed plate of a reed instrument, such as a mouth-organ or accordion. To: Hough and Kohler, Ltd. (Canada).

Refers to a reed plate provided with valves each consisting of two or more strips of plastic.

B.P. 722,839. Decreasing of the thermoplasticity of high polymers. To: Farbenfabriken Bayer A.G. (Germany).

B.P. 722,875. Apparatus for, and method of treating, plastic film. To: Visking Corp. (U.S.A.).

A polyethylene film is passed through the zone of action of high-voltage electric stress accompanied by corona discharge. Printing inks then adhere tenaciously to the treated film.

B.P. 722,887. Method of manufacturing plastic teeth and products obtained thereby. A. Gotlib, Plastiques Dentaires et Médicaux (France).

Teeth portions subjected to masticatory or incisive stresses are reinforced with glass or quartz fibres agglomerated by synthetic resins.

B.P. 722,892. Phenolic resin-bonded plywood. E. T. J. Fuge, M. J. Rose, H. Taylor. To: Monsanto Chemicals, Ltd.

B.P. 722,896. Dust shields for corners. B. J. Grout, D. G. Everett, M. E. R. Everett.

B.P. 722,903. Process for making expanded or cellular bodies of the closed-cell type. To: Lonza Elktrizitätswerke and Chemische Fabriken A.G. (Switzerland).

The gas-absorbing properties of thermoplastic resins are greatly increased by placing the resin first under a high temperature to form a solid-elastic intermediate product and then introducing a gas under pressure which fills minute pockets within. When heated the gas expands and produces bodies with very regular cell structure.

B.P. 722,904. Phenolic resin-bonded plywood. E. T. J. Fuge, M. J. Rose, H. Taylor. To: Monsanto Chemicals, Ltd. (div. out of 722,892).

B.P. 722,926. Method of manufacturing adhesives. N.V. Philips' Gloeilampenfabrieken (Netherlands).

A solution of a heat-hardenable urea-formaldehyde precondensate in water containing a polyhydric phenol and a primary aromatic amine.

B.P. 722,963. Moulding articles having a

metal layer thereon, e.g., mirrors and reflectors. To: Philips Electrical Industries, Ltd. (Netherlands).

Varnishes on the basis of cellulose acetate or polyvinyl chloride are used as coats on metal moulds and as protection of metal layers.

B.P. 722,969. Automatic sealable paste tube of plastic or similar material. To: Aktiebolaget Svenska Kapsylfabriken (Sweden).

A spring around the flattened neck portion is employed.

B.P. 722,985. Musical instrument. F. A. Middleton.

A "pipe of Pan" from two parts of plastics and a reed plate and reeds produced as a single component by pressure moulding.

B.P. 723,041. Apparatus and method for preforming sheeting or coating operations by rolling or calendering. W. W. Triggs. Comm. from: Wingfoot Corp.

The axis of one of a pair of rolls can be cambered or bent into accurate shape by applying pressure to parts of the bearings.

B.P. 723,059. Polyvinyl-chloride compositions. H. Newby. Comm. from: Chemische Werke Huls.

Copolymers of vinyl chloride and styrene are employed during the working-up of the polyvinyl chloride.

B.P. 723,071. Combination nursery birdcage and bird bath. E. G. Hale, S. A. Hale, E. A. Hale.

Base and roof made of plastics.

B.P. 723,072. Insulating coatings on conductors. General Electric Co. (U.S.A.).

Polytetrafluoroethylene and organopolysiloxane resin are blended as dispersions or emulsions in water in certain proportions. Thicker coatings can then be applied without the danger of cracks.

B.P. 723,141. Electric incandescent lamps containing resinous foam. To: Philips Electrical Industries, Ltd. (Netherlands).

A mixture of a phenol-aldehyde condensation product and hexamethylene tetramine in the cap produces gases on heating while the formaldehyde given off acts as hardener.

B.P. 723,191. Gliding clasp fastener. To: Deutsche Gold- und Silber-Scheideanstalt vorm. Roessler (Germany).

Two symmetrically constructed fastener members of elastic flexible material, each with a row of teeth and a guide parallel thereto a flank of the guide and/or of each tooth being undercut.

B.P. 723,233. Semi-permeable membrane. H. T. Hookway, R. Townsend. To: National Research Development Corp.

The water content of a film of polyvinyl alcohol is increased by a swelling process beyond a certain stage.

B.P. 723,278. Process for bonding polyamides to polyvinyl chloride or copolymers thereof. F. Ritter (Germany).

Artificial leather is made by precoating polyvinyl chloride or copolymers with two intermediate layers (polymers of acrylic or methacrylic acid ester; solution of nitrocellulose) and then applying the polyamide.

B.P. 723,282. Hinged strut or stay for photograph frames, stands, and like articles. F. W. Tomkinson, Ltd., E. M. Tomkinson.

B.P. 723,343. Cycle or like reflectors. G. B. Clammer.

A central reflecting portion surrounded by a luminescent area with the words "Safety First."

B.P. 723,396. Tacky pressure-sensitive adhesive tape, more particularly for tab punches. C. Koenig (Germany).

The base foil of synthetic resinous material has shallow small indentations and two individual tacky strip coatings, so as to leave a middle zone and narrow border zones at the edges uncoated. The layers easily separate when the tape is drawn from a roll.

B.P. 723,423. Packages for ferrous objects. To: Gillette Safety Razor Co. (U.S.A.).

The package contains a small amount of a compound which reacts with the blade surfaces to provide a rust-preventing coating.

B.P. 723,457. Joint for an electric cable. J. R. Eyre. To: Standard Telephones and Cables, Ltd.

Thin lead sheaths surrounded by a rubber sleeve bound down around the polythene cable sheath to form a water-tight seal.

B.P. 723,467. Cellular phenolic resin. To: Union Carbide and Carbon Corp. (U.S.A.).

An aliphatic ether is added.

B.P. 723,545. Closures for bottles and like containers. G. T. Jenner, A. G. Hill. To: British Drug Houses, Ltd.

A dished polythene sealing cap between neck and screw cap.

B.P. 723,588. Liquid containers. J. Lyons and Co., Ltd., P. Whyte.

Opposed flaps at the opening terminating in the internal flap valve of the polythene container hold a drinking straw securely in position.

B.P. 723,598. Method of producing electrically conductive mouldings from plastics. To: N.V. Philips' Gloeilampenfabrieken (Netherlands).

The plastic is reduced to granules and the individual grains (0.3 mm.) are provided with electrically conductive coatings and the powder then moulded under heat and pressure.

B.P. 723,621. Lightweight laminated building unit. G. C. Sullivan. To: Lockheed Aircraft Corp. (U.S.A.).

A cellular reaction product of an alkyd resin and a polyisocyanate partly fills the spaces between the spaced sheets.

B.P. 723,627. Synthetic resins containing insect attractants or insect repellents. P. Bracey. To: National Research Development Corp.

An aminoplastic resin in an organic solvent.

B.P. 723,631. Polyethylene films. W. Berry, R. A. Rose, C. R. Bruce. To: British Cellophane, Ltd.

By irradiation with ultra-violet light, ready acceptance of printing ink is obtained.

B.P. 723,642. Sealing of an open end of a container by the use of resin. S. T. Jolly. To: Electric and Musical Industries, Ltd.

The open end is placed in a mould and closed by a mixture of polyaryl-ethyleneoxide resin using a hardening agent and heat.

B.P. 723,643. Manufacture of thermoplastic compositions. W. H. Hogg, T. R. Evans, R. Cantor. To: Dunlop Rubber Co., Ltd.

Finely divided thermoplastic material (polyvinyl compounds) in a plasticizer is spread as a thin layer on a support, heated and cemented into a friable solid sheet, then disintegrated.

B.P. 723,644. Manufacture of materials having coloured patterns thereon. R. Cantor, W. H. Hogg, T. R. Evans. To: Dunlop Rubber Co., Ltd.

B.P. 723,717. Tag or label. H. J. Simpson.

A cardboard disc between transparent discs in a grooved rubber ring.

B.P. 723,730. Method and apparatus for continuously forming elongated shapes from thermoplastic materials. To: Polymer Corp. (U.S.A.).

The speed of the screw-feed mechanism is controlled to ensure uniform pressure at the inlet end of the (rod or tube) forming device. Of special use for shaping polyamides.

B.P. 723,744. Manufacture of laminated transparent articles. E. Käsemann (Germany).

Cementing of hygroscopic polarizing foils of synthetic plastics between glass plates.

B.P. 723,789. Luminescent material and indicators which include such materials. J. Friday.

B.P. 723,824. Press with hydraulically operated press plungers. H. Studli.

A first press plunger of large cross-section and short stroke and a second plunger of smaller cross-section and longer stroke acting in opposite directions. The press plate between the plungers is taken along by the second plunger for part of its stroke, then locked in position while the plunger continues its movement.

B.P. 723,884. Synthetic resin adhesives. E. G. K. Pritchett, P. R. Cross. To: Bakelite, Ltd.

For the manufacture of plywood. The adhesive comprises a phenol-formaldehyde condensation product and a vegetable tannin containing phlobatannin.

B.P. 723,901. Process of making fibrous webs. To: Industrial Tape Corp. (U.S.A.).

Refers to the addition of wet-strength additives to paper pulp using an organic polymer salt as agent.

B.P. 723,915. Fluorocarbon resinous products and composite articles containing the same. To: United States Gasket Co. (U.S.A.).

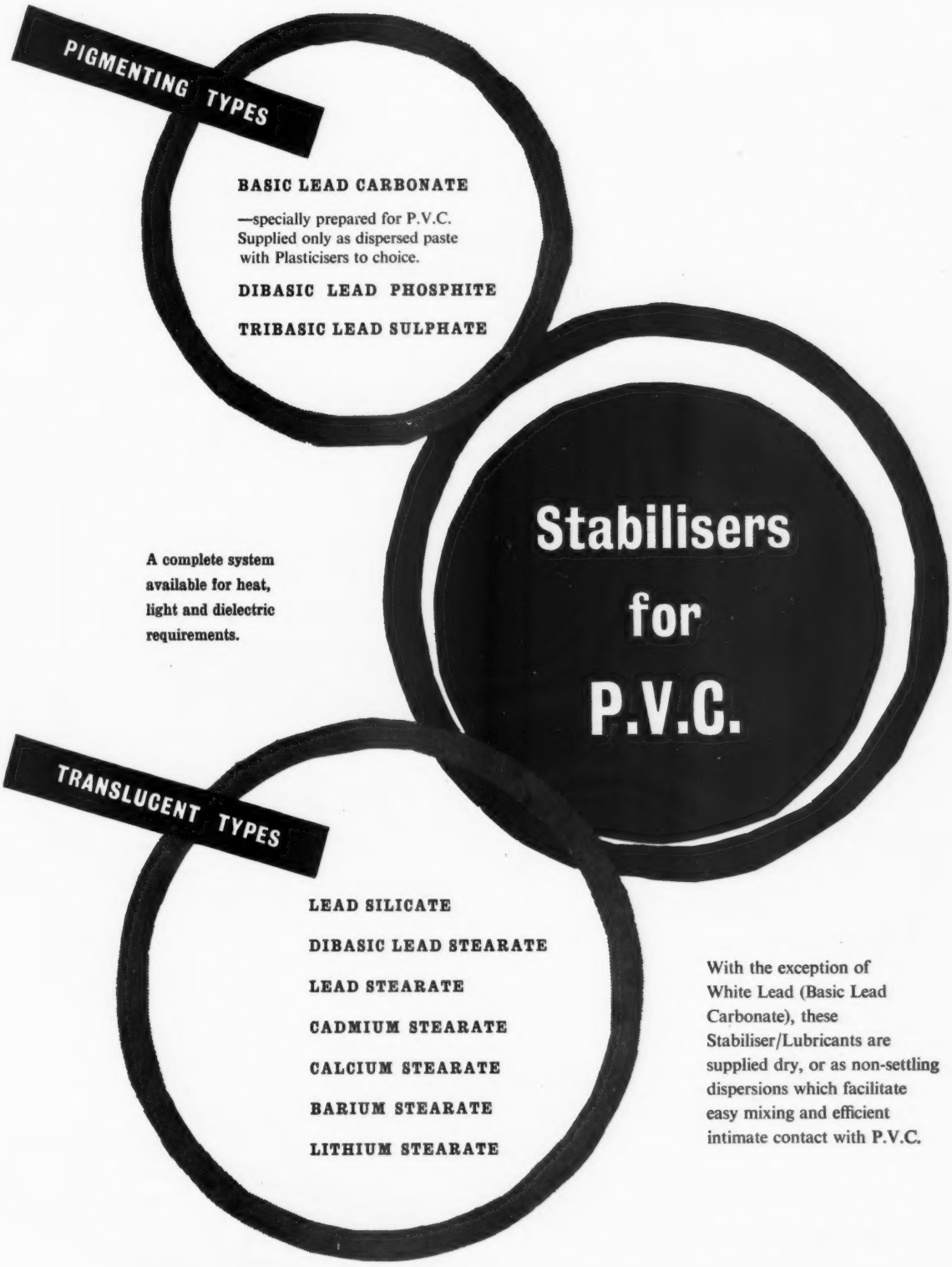
The insulating properties of the Teflon resin (polytetrafluorethylene) are retained while its resilient characteristics are modified by the addition of powdered glass or ceramic material to impart rigidity.

B.P. 723,920. Manufacture of a continuous filament tow. R. E. Jones, R. G. Wakerley. To: I.C.I., Ltd.

An electrostatic charge is induced in the filaments to facilitate intermingling when feeding the bundles into a tube through which air flows under a pressure of 60 to 100 lb./sq. in.

B.P. 723,956. Process for producing cellular thermoplastic bodies. To: Lonza Elektrizitätswerke und Chemische Fabriken A.G. (Switzerland).

A thermoplastic mass (polyvinyl chloride) is heated in a mould while exposed to a gaseous medium under pressure. The gas containing body is then cooled and the pressure reduced. On removing from the mould the body expands with all cells closed. Further heating under pressure followed by a pressure reduction result in full expansion at atmospheric pressure.



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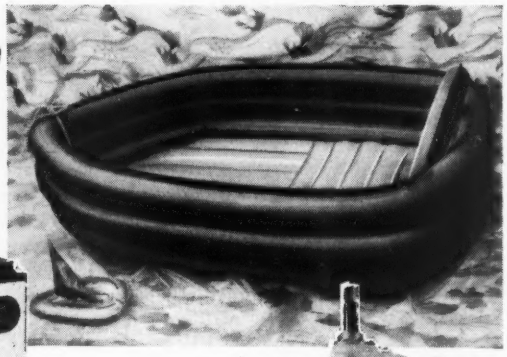

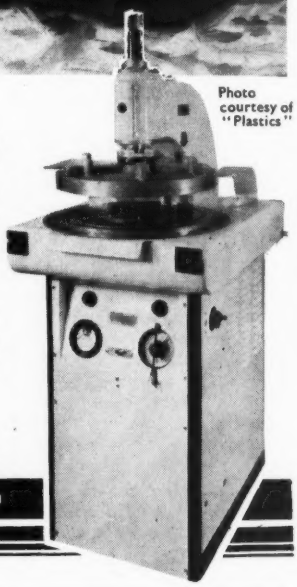

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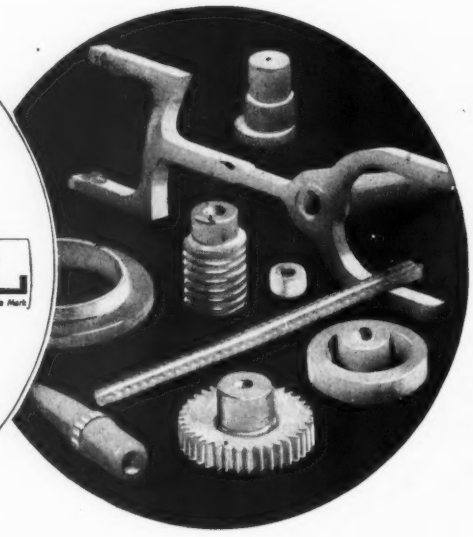

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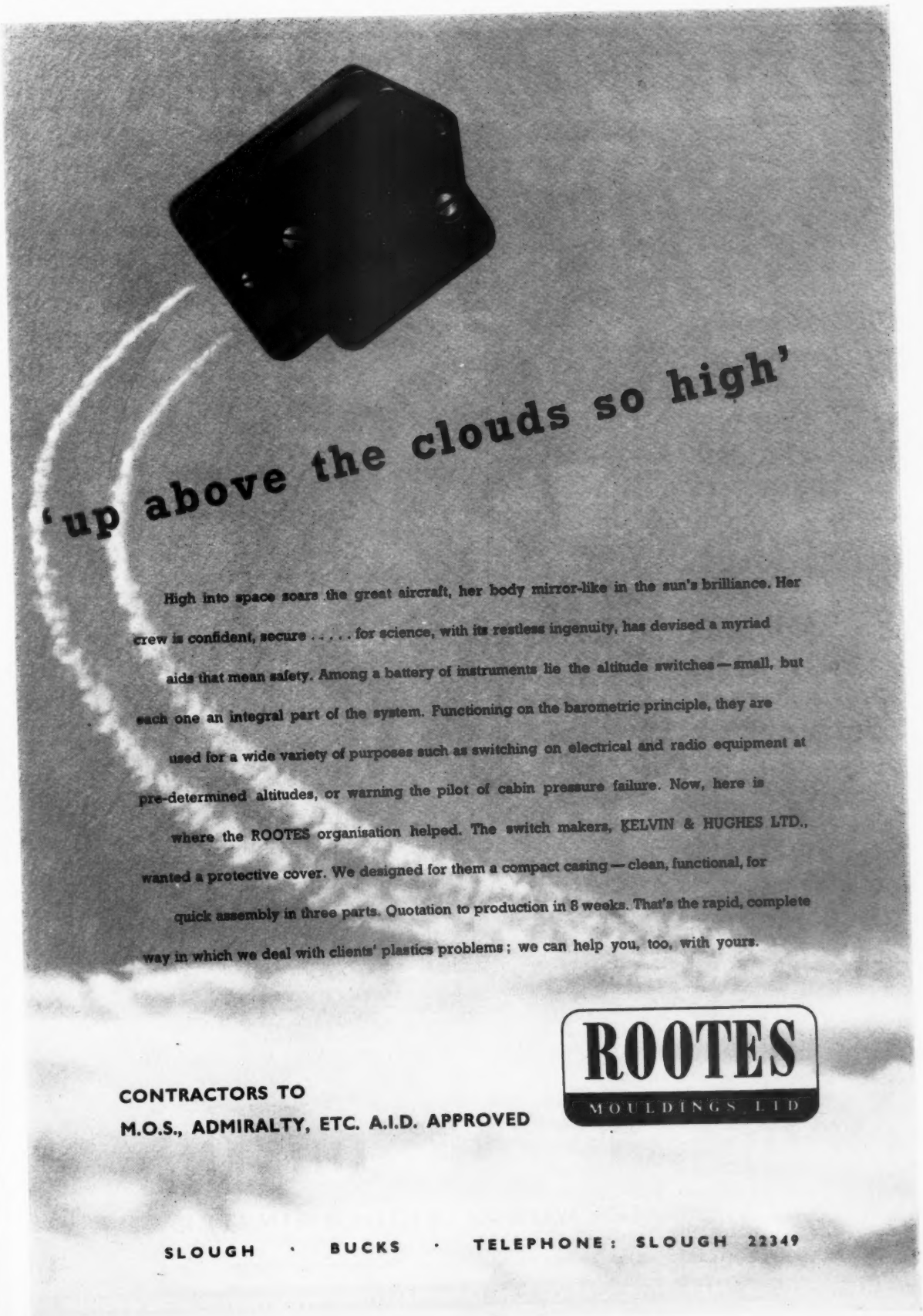
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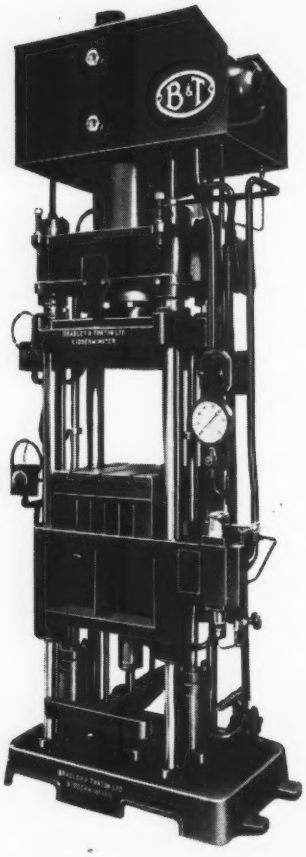

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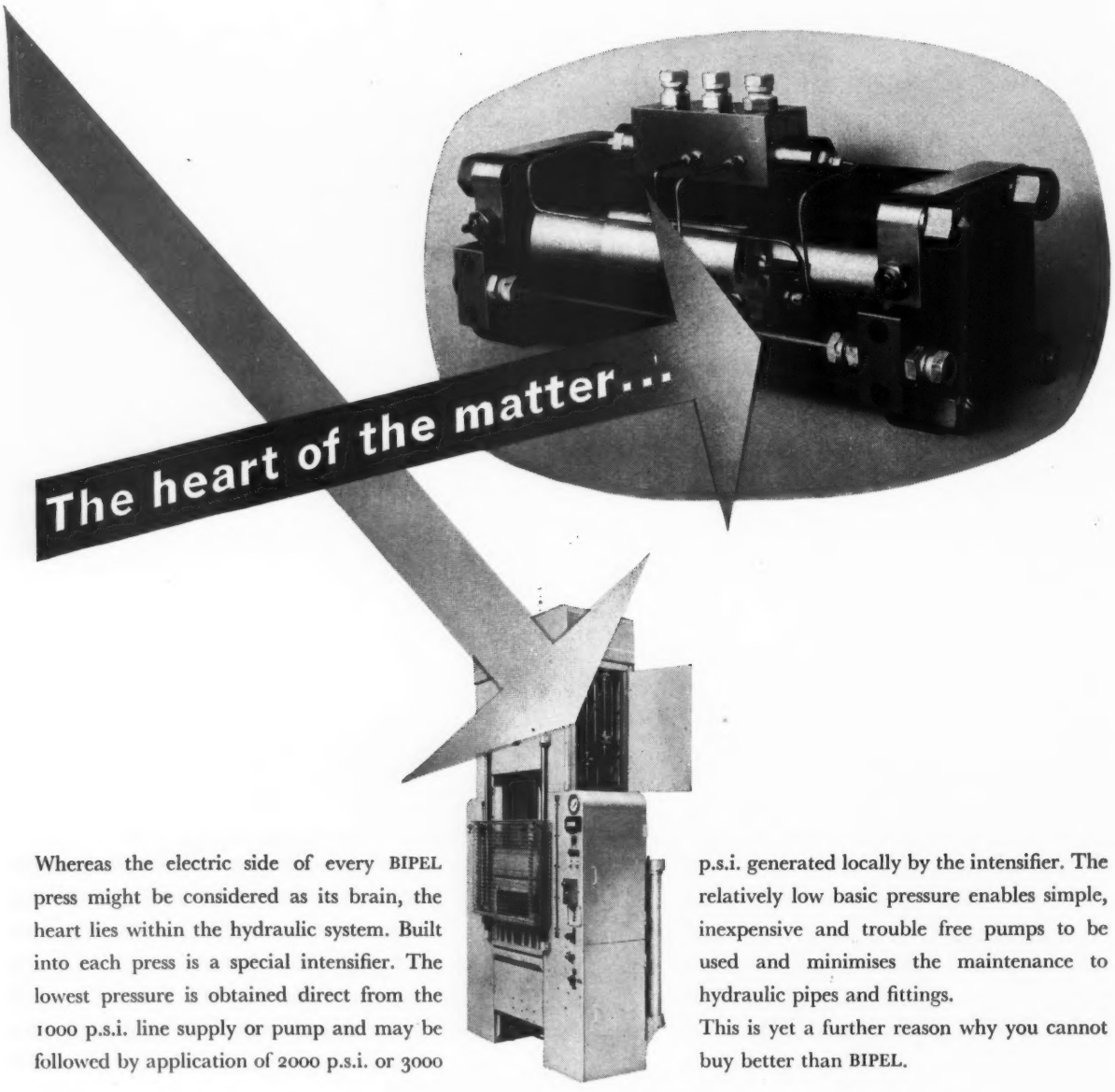

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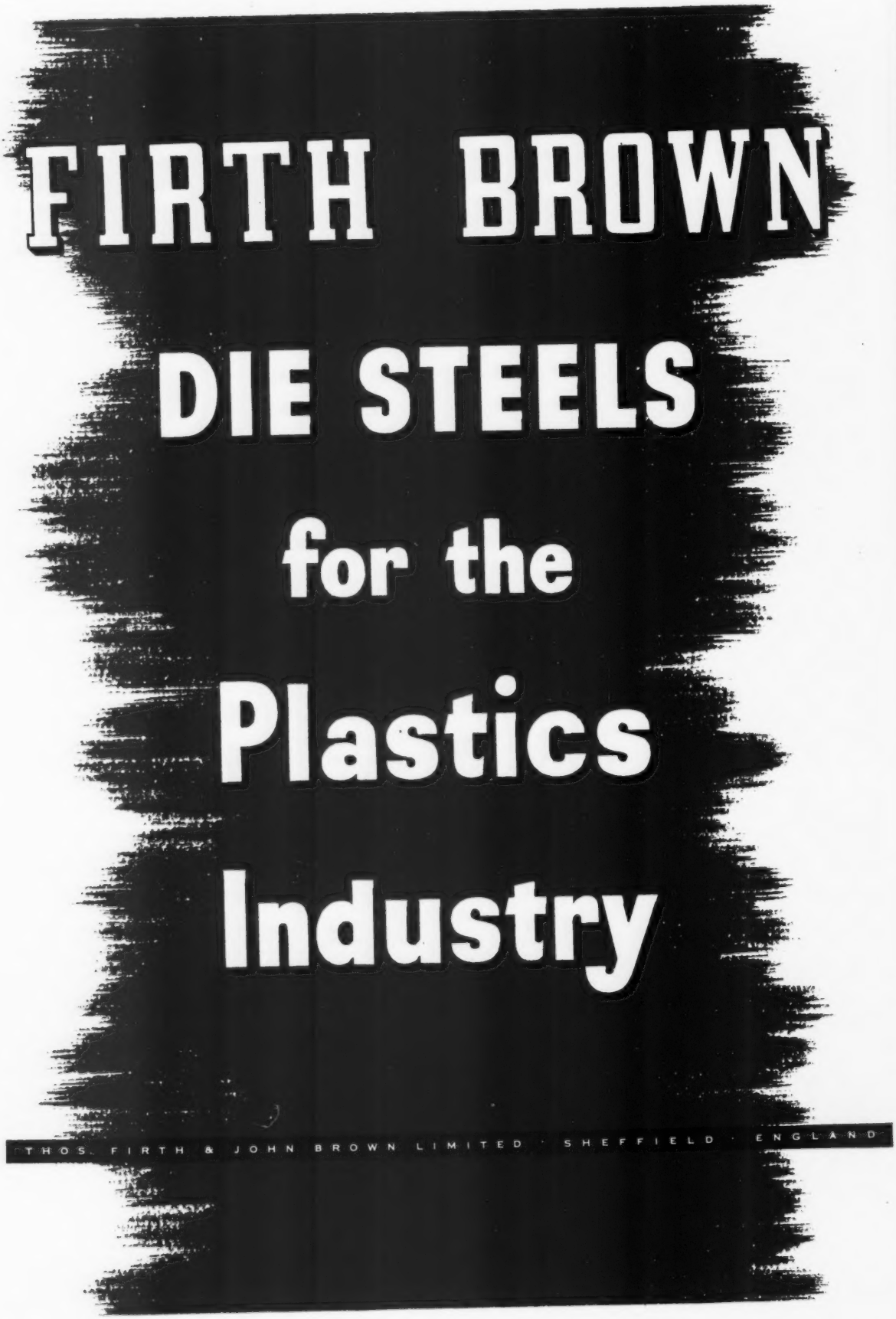
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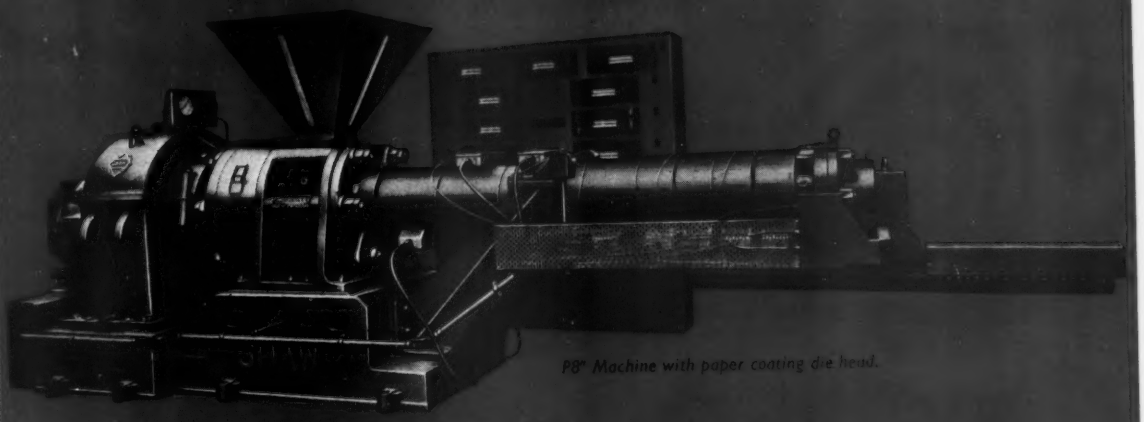

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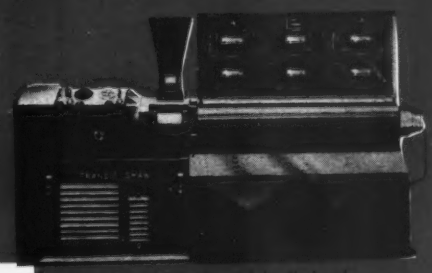

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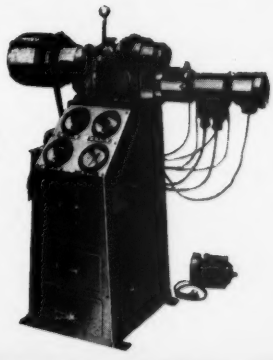

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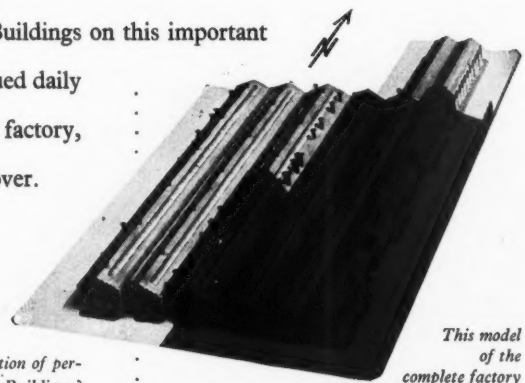

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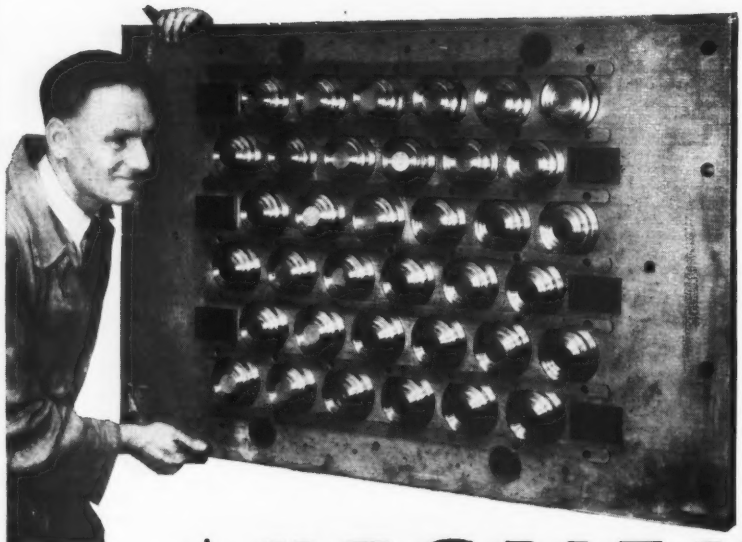

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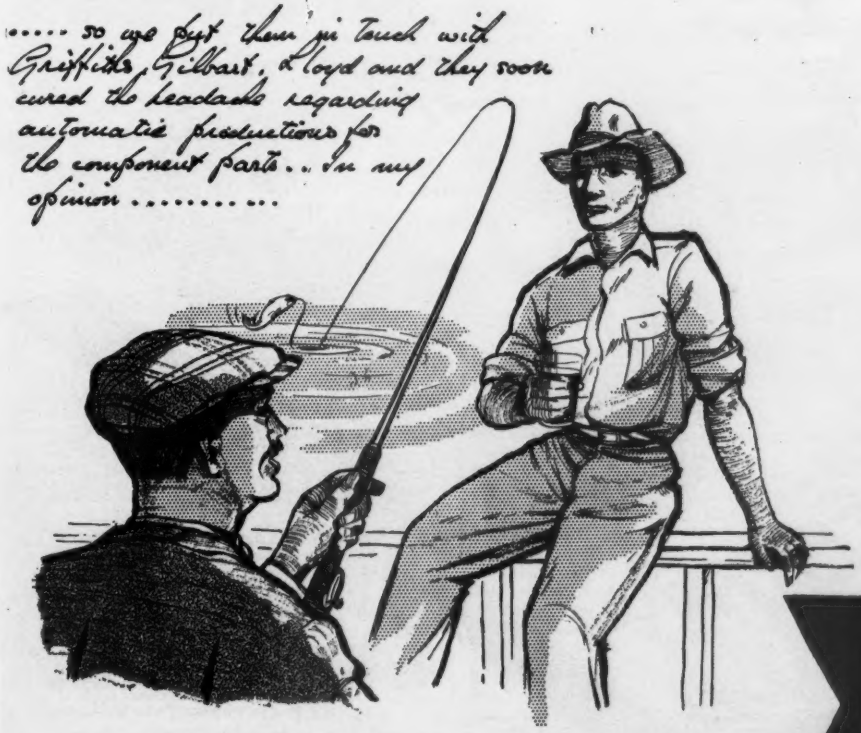
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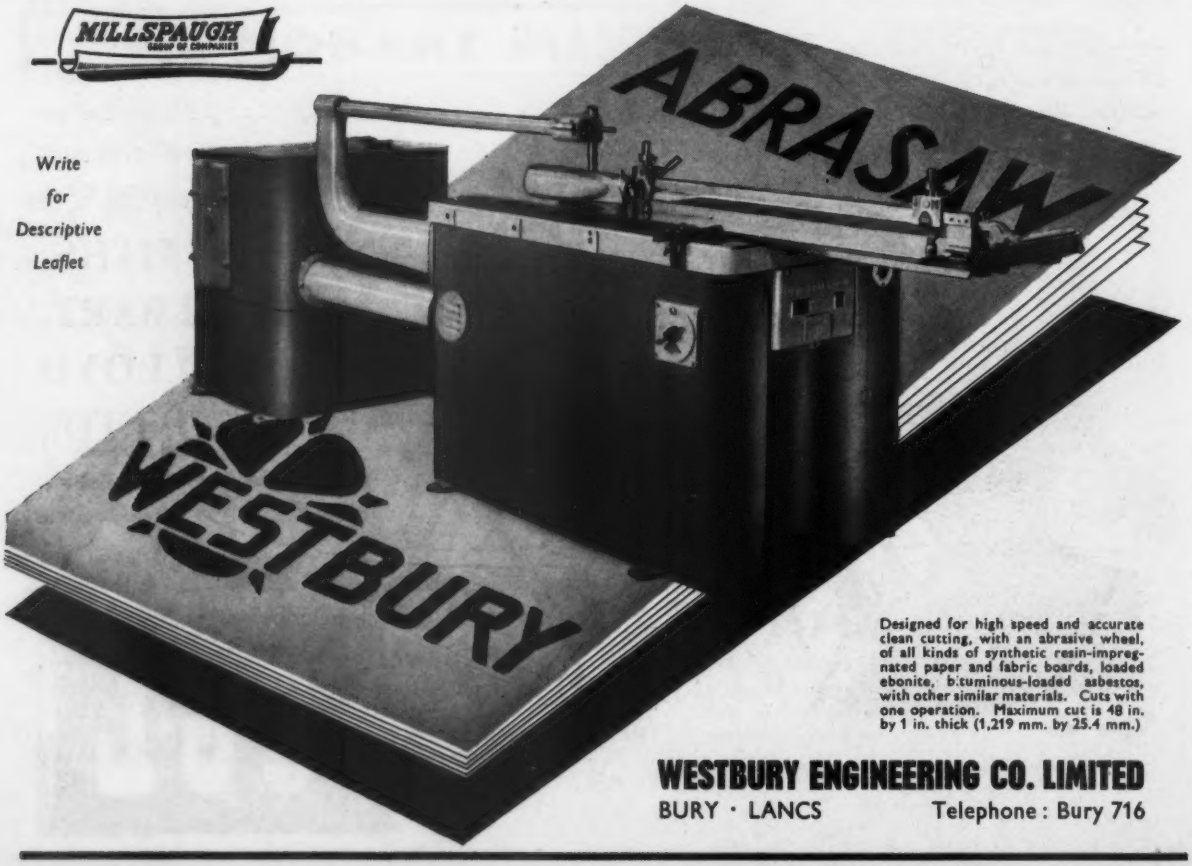

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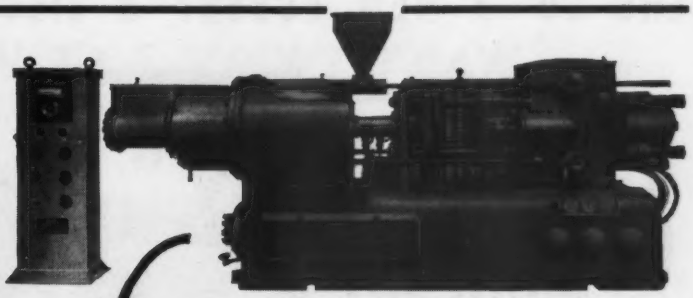

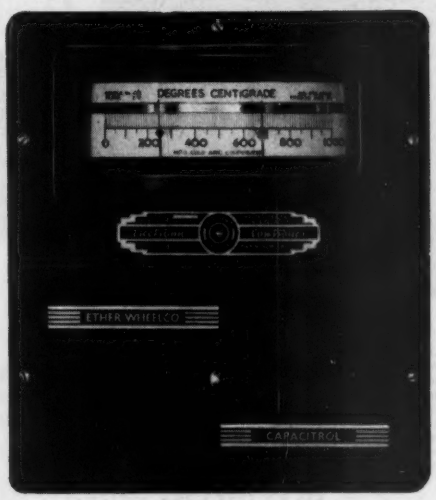

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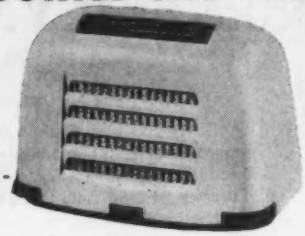

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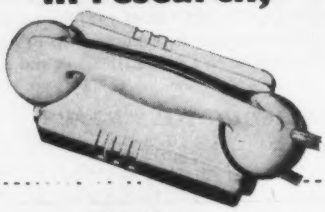

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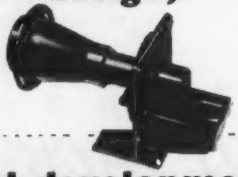

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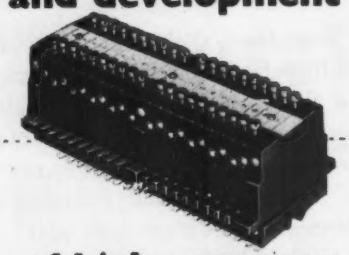

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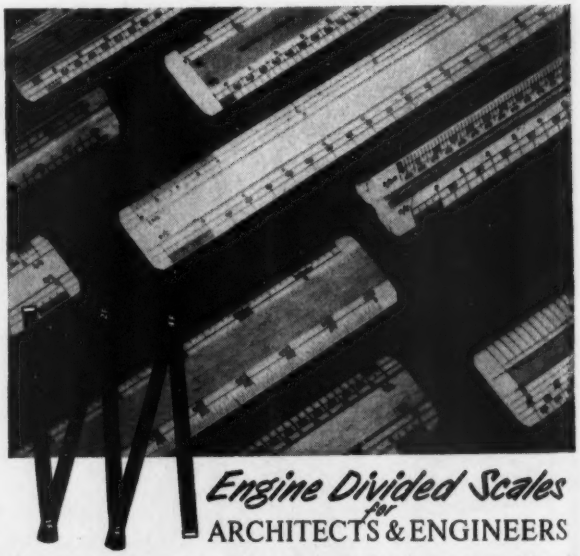

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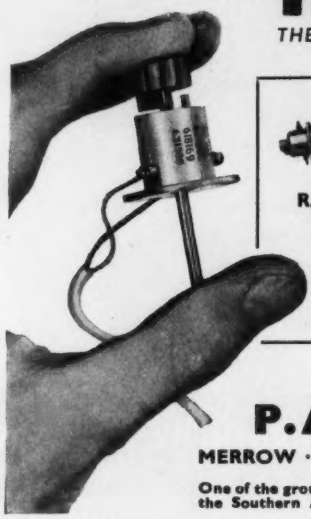

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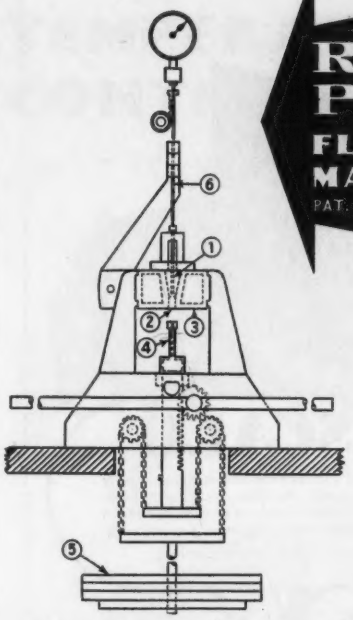

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CELLULOSE ACETATE · BUTYRATE
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FOR THE PLASTICS TRADE

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Wanted
STOCKS for CASH

We are cash buyers of merchandise of every description. Also Clearance Stocks, Discontinued Lines, Surplus and Redundant Stocks, BOTTLES, Jars, Screw Caps, Cartons, and other Packaging Materials. In fact, goods of all kinds can be disposed of through us without delay, on the most favourable terms, and without trouble.

Should you have anything for disposal either now or at any future time please send us samples, full particulars and price on a cash settlement basis and the matter will have our immediate and careful attention.

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CANNING POLISHING COMPOSITIONS
for PLASTICS
AND OTHER NON-METALLIC SUBSTANCES

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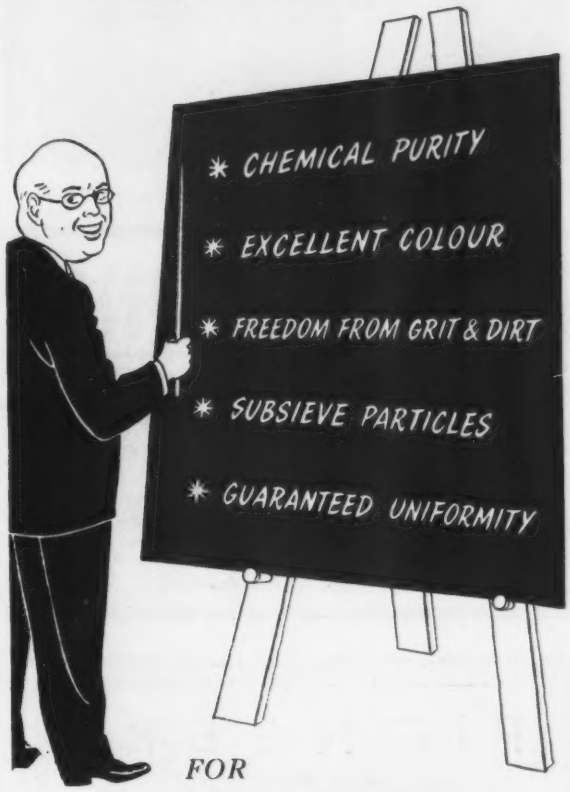

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ON
NEW INJECTION MOULDERS
(MOULDINGS UP TO 2 OZ.)

CELLULOSE ACETATE, POLYSTYRENE, ETC.

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An aid to toolmakers in the plastics and pressure diecasting industries dealing with mould design, construction and maintenance.

"An important and comprehensive handbook for plastic-mould engineers and to all those connected with manufacturing plastics products."—MODERN PLASTICS

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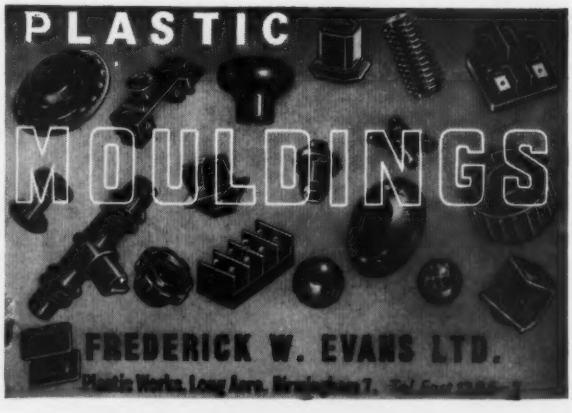

Classified Advertisements

PRESS DAY.—Classified advertisements for the May issue must be received at Head Office by first post Tuesday, April 26th. Last-minute additions and deletions are accepted by telephone from trade advertisers up to noon. Advertisements received too late for a particular issue are automatically inserted in the succeeding one unless instructions to the contrary are received.

RATES.—4d. per word (minimum 12 words 4/-). Each paragraph charged separately and name and address must be paid for. Semi-displayed setting 35/- per single column inch. Series discounts of 5% for 6, and 10% for 12 consecutive insertions allowed to trade advertisers.

TERMS.—Strictly net and prepayable. Monthly accounts or settlement by the end of the month following insertion are allowed to trade advertisers if satisfactory references are provided.

REMITTANCES.—Cheques and postal orders should be crossed and made payable to TEMPLE PRESS LIMITED and instructions sent addressed to the Manager, "Plastics," Bowling Green Lane, London, E.C.1.

THE PROPRIETORS retain the right to refuse or withdraw advertisements at their discretion and are not responsible for clerical or printers' errors although every care is taken to avoid mistakes.

BOX NUMBERS.—Private advertisers desiring to have replies sent care of "Plastics" may do so on payment of 1/- to cover booking and postage, plus cost of four extra words. To avoid mistakes in forwarding, Box Numbers should be carefully and legibly copied and replies sent to Box P000, care of "Plastics," Bowling Green Lane, London, E.C.1.

DEPOSIT SYSTEM facilities are available to readers to purchase advertised goods through "Plastics." Commission 1% (minimum 2/-) on amount deposited.

HEAD OFFICES: Bowling Green Lane, London, E.C.1, England. Telephone: Terminus 3636. Telegrams: "Pressimus, Phone, London."

BRANCH OFFICES: 7 John Bright Street, Birmingham, 1. Telephone: Midland 4117-8. 50 Hertford Street, Coventry. Telephone: Coventry 62464. 1 Brazennose Street, Manchester. Telephone: Blackfriars 5038-9. 12 Renfield Street, Glasgow. Telephone: Glasgow Central 1413.

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ESTABLISHED 1855.

EDWARD RUSHTON, SON AND KENYON,
INDUSTRIAL VALUERS, AUCTIONEERS AND
FIRE LOSS ASSESSORS,
12 YORK STREET,
MANCHESTER, 2.
Phone, Central 1937-8.
Grams, Russonken, Manchester.
zzz-486

BUSINESS OPPORTUNITIES

PROGRESSIVE COMPANY marketing plastic goods, offers services to manufacturers as sole distributors. All offers to Acro Marketing, Ltd., 9 Warwick Court, W.C.1. 216-12

VACUUM-FORMING CAPACITY available together with full facilities for fabricating engraving and printing of all plastic materials. Omega Plastics, Ltd., Highbridge Rd., Town Quay, Barking, Essex. 216-13

A NATIONAL FORM OF PLASTIC DISTRIBUTORS with first-class home and export accounts are interested in purchasing total production of new hardware products from reliable suppliers. Write, in confidence, to Sales Manager, Box P1314, care of "Plastics." 213-17

MANUFACTURER wishes to acquire interest in plastic injection-moulding business in or near London with good assembly facilities. Can guarantee to fill capacity. Write to Citroen, Howard, Marks and Co., 82 Portland Place, W.1. 213-5

WE OPERATE the most efficient and extensive distribution service for plastic products in Great Britain, with or without manufacturing facilities. Designers with ideas for exploitation and moulders, etc., having products, particularly those of interest to the hardware trade, requiring nation-wide distribution, should write in confidence to the Managing Director, Box P1327, care of "Plastics." 213-29

LENSES

PLASTICS LENSES with good optical properties for the toy and instrument trade. Lenses for toy telescopes, binoculars, microscopes and viewers available ex-stock. Alana Optical, Ltd., Industrial Estate, Bridgend, Glam. Phone 942. 213-xA590

MACHINERY, TOOLS AND PLANT

HYDRAULIC. Frazer Mono-radial pumps, new and second-hand in stock. Thompson and Son (Millwall), Ltd., Cuba St., London, E.14. East 1844. zzz-483

ALTERATIONS. Diesel sets, electric motors, switch gear, transmission equipment, fluorescent lighting and industrial fittings ex stock, keen prices. Contact G. L. Murphy, Ltd., Manston, near Leeds. zzz-489

STOCK DELIVERY. Four-cylinder hydraulic pumps, 4 g.p.m., 1 ton pressure, £30, or motorized 3-phase, £70. John Steel, Castlefields, Bingsley. zzz-495

SEEING IS BELIEVING!!! Make a point to see our new powerful motorized dust, fume extractor-blower units at new low price (£23). Everyone doing so, is most impressed. Bellangers, 306 Holloway Rd., London, N.7. North 4117. 216-1119

FOR DISPOSAL, four plastic compression-moulding machines, 19-ton capacity, £150 each; one ⅝-oz. Francis Shaw injection moulder, £180. All little used, ex-factory. Box P1325, care of "Plastics." 213-27

NEW HIGH-SPEED ELECTRIC BANDSAWS for sale, for cutting polythene, P.V.C., rubber, Perspex, cork, leather, cloth, etc. Stainless-steel or wood table. Three sizes, 24 in., 30 in., 36 in. Maximum height of cut on 36-in. machines, 19 in. 400/440/3-phase supply. Illustration and prices from makers, F. J. Edwards, Ltd., 359 Euston Rd., London, N.W.1. Eus 4681. 213-31

Machinery, Tools and Plant (contd.)

HYDRAULIC PRESSES

400-ton Downstroke by Greenwood and Batley, 16-in. dia. main ram by 28-in. stroke. Four cols. 20½ in. by 17¾ in. between. 36 in. by 17½ in. table. Daylight 41 in. W.P. 2 ton sq. in.

250-ton Upstroke by Henry Berry. 15-in. dia. Fescolised ram by 20-in. stroke. Four cols. 23½ in. by 11½ in. between. Table 23½ in. by 22 in. Daylight 20 in. W.P. 1½ ton sq. in.

200-ton Upstroke by Hydraulic Eng. D/A piston-type ram 10-in./10½-in. dia. by 20-in. stroke. Four cols. 25 in. by 15 in. between. Table 31 in. by 25 in. Daylight 12½ in. W.P. 2½ tons sq. in. With electric platens and Towler pumping equipment.

160-ton Self-contained Downstroke by E.M.B. Fabricated frame. Fitted electric platens 24 in. by 19 in. Daylight 16 in. Bottom hydraulic ejector or transfer ram 5½-in. dia. by 6½-in. stroke. Arranged for automatic prefilling with Towler "Electraulic" pump, safety guards, etc.

100-ton Downstoke by Bradley and Turton. 12-in. dia. ram by 10-in. stroke. Four cols. 21½ in. by 11 in. between. Table area 21½ in. by 21 in. Daylight 21 in. Arranged for semi-automatic prefilling. W.P. 1 ton sq. in.

100-ton Downstroke by Finney. 12-in. dia. ram by 20-in. stroke. Four cols. 30½ in. by 14½ in. between. Tee-slotted table 2-ft. sq. Daylight 32 in. Arranged for automatic prefilling with bottom ejected. W.P. 1 ton sq. in.

30-ton Downstroke by Finney. 10½-in. dia. ram by 18-in. stroke. Four cols. 21 in. by 10 in. between Tee-slotted table 18 in. sq. Daylight 30 in. Arranged for automatic prefilling with bottom ejector. W.P. 1 ton sq. in.

65-ton Upstroke by Rice. 9-in. dia. ram by 10-in. stroke. Four cols. 13 in. by 13 in. between. Table 21 in. by 13 in. Daylight adjustable 22 in. to 18 in. W.P. 1 ton sq in

50-ton Upstroke Laboratory by Finney. 5-in. dia. ram by 8-in. stroke. Four cols. 15 in. by 10 in. between. Table 16 in. by 15 in. Head screwed down by means of screw and handwheel giving adjustable daylight 9½ in. to 21 in. Complete with Venning high-speed pump and 14-in. sq. platens.

50-ton Downstroke "Coborn," 8-in. dia. ram by 14-in. stroke. Four cols. 15 in. by 9 in. between. Table 17 in. by 15 in. Fitted with 17½ in. by 14½ in. electric platens, with thermostats. Daylight 17½ in. Included are hydraulic ejector, prefil tank, valve, Towler "Electraulic" pumping equipment, control gear, etc.

GEORGE COHEN, SONS, AND CO., LTD.,
WOOD LANE,
LONDON, W.12.
Phone, Shepherds Bush 2070
and
STANNINGLEY, NEAR LEEDS.
Phone, Pudsey 2241. 213-4

FOR SALE, two pre-heating gas ovens as manufactured by Chandos Engineering Co., Ltd. View by appointment. Box P1312, care of "Plastics." 213-15

PLASTICS MACHINERY.

Hydraulic Presses of all sizes. Injection Machines. Extruders. Mixing Mills. Hydraulic Pumps and Accumulators.

Send your requirements to the specialists,
REED BROTHERS (ENGINEERING), LTD.,
REPLANT WORKS,
CUBA STREET, MILLWALL, E.14.
Phone, East 4081 (five lines). 213-36

Machinery, Tools and Plant (contd.)

EDGWICK 1¼-OZ. HAND-OPERATED INJECTION MACHINE, Daniels reconditioned. No. 2 vertical reciprocating single-action 2-stage compressor, Reavell reconditioned. Two air bottles, 800 lb. pressure fittings, spares, first-class working condition. Offers. Severn Plastics, Stonehouse, Glos. 213-x9966

SURPLUS TO REQUIREMENTS. Murphy R.F. oscillator, 1 kW. 80 Mc/s., inspection Bristol area, £120 or offers. Little used since purchased in 1946. Box P1334, care of "Plastics." 213-41

FRANCIS SHAW 10-GRAMME HAND INJECTION MOULDING MACHINE complete with a die lock, in working order, any examination welcomed, £45. Box P1330, care of "Plastics." 213-x278

MACHINERY, TOOLS AND PLANT WANTED

INJECTION MOULDING MACHINES required. Condition or size not important. Send details. Box P0814, care of "Plastics." 213-1090

INJECTION MACHINES, 3 and 4 oz., wanted. Norton Plastics, Ltd., Ilkeston, Derbyshire. 213-3

COMPRESSION AND INJECTION-MOULDING TOOLS WANTED. Send details of your surplus, obsolete and redundant moulding tools. Box P1311, care of "Plastics." 218-1129

WANTED, 50-ton hydraulic moulding presses, preferably in banks of two. Box P132, care of "Plastics." 213-8

WE BUY redundant or obsolete injection moulds for hardware or novelties. Send samples and full details to Box P1313, care of "Plastics." 213-16

REQUIRED: Davidson's Plasticor or similar type injection moulding machine, compressed air operated, with or without compressor, state lowest price. Box P1329, care of "Plastics." 213-x514

MISCELLANEOUS

EXTEND YOUR TRADE.

Use a trade mark. Consult
Trade Mark Protection Society,
12 Church St., Liverpool. zzz-478

MOULDS

WE MAKE DIES AND INSERTS (particularly geometric designs) for the plastics and rubber industry. We shall be glad to quote; send your sketch/drawing or sample to Alana Optical, Industrial Estate, Bridgend, Glam. Phone 942. 213-xB590

DOLL MOULDS FOR HIRE.

10-in., 12-in., 18-in., 25-in. baby and girl dolls with sleeping eyes. Injection moulders and dolls' manufacturers please write to: Holloway Dolls (London), Ltd., 27 Church Crescent, London, N.20. 215-1124

MOULDS WANTED

PENHOLDER MOULD wanted (not fountain-pen or ball-point type). Sample moulding, details and price asked to Box P1331, care of "Plastics." 213-x9219

PATENTS

PATENT APPLICANT PLASTIC INJECTION MACHINE. Would demonstrate prototype to interested manufacturers, by appointment. Box P1219, care of "Plastics." 214-1122

PRODUCTION CAPACITY

KINGSTON PLASTICS, LTD., Unity Works, Union St., Kingston-on-Thames. Manufacturers of virgin and second-grade cellulose acetate moulding powders, matched to customer's own requirements for colour and flow. Customer's own waste also reprocessed to specified requirements. Sorting and grinding, incorporating magnetic separation of metallic particles of all thermoplastics undertaken. Phone, Kingston 8405. 213-1084

Production Capacity (contd.)

CHIPPING OF PLASTICS AND GRINDING, screening, mixing and drying of all raw materials undertaken for the trade. Crack Pulverizing Mills, Ltd., Plantation House, London, E.C.3. Man 4405. zzz-487

INJECTION MOULDINGS IN THERMO-PLASTICS. Moulding in styrene, acrylics and acetate. Design and tooiroom facilities available for mould construction. Inquiries invited. J. and E. Courtenay, Ltd., 138 Stratford Rd., Birmingham, 11. 214-1093

VISIJAR LABORATORIES, LTD.,
THE LEADING CRAFTSMEN IN
" PERSPEX "
PROTOTYPE AND REPETITION.
OFFICIAL I.C.I. STOCKISTS " PERSPEX "
SHEET, TUBE, ROD.
STOCKISTS AND FABRICATORS OF " FORMICA."
149 LONDON ROAD, CROYDON, SURREY.
Phone, Croydon 8228 (two lines). zzz-492

INJECTION MOULDINGS by I.O.G. Industries, Ltd., 41 Marshgate Lane, Stratford, E.15. Maryland 2804. 220-1094

PLASTICS (MANCHESTER), LTD.,
BRITAIN'S LEADING STOCKISTS AND
DISTRIBUTORS.
SPECIALISTS IN
FABRICATION, INJECTION MOULDING AND
ENGRAVING.
11 WHITWORTH STREET,
MANCHESTER, 1.
Central 7081-2 and Central 1000. zzz-493

VACUUM MOULDERS invite trade inquiries for vacuum-formed articles, moulded in p.v.c., styrene, cellulose acetate, etc. Maximum mould size 36 in. by 36 in. Write Box P098, care of " Plastics." 217-1112

PULVERIZING, grinding and chipping to the trade. L. Lipton, Ltd., Lamprell St., Bow, E.3. Adv 3345. 214-1113

REPETITION in Ebonite, Erinoid, etc. Capstan lathe work. Tempie St., Rugby. Phone 4059. 223-1118

DINES PRODUCTS, Whitehall Lane, Grays, Essex, for injection mouldings. 223-1120

ELCO PLASTICS, LTD.,
HIGH WYCOMBE,
BUCKS.
A.I.D. APPROVED.
MOULDERS, INJECTION, COMPRESSION,
TRANSFER, SIDE RAM.
HIGH WYCOMBE 1921-2. zzz-498

CAPACITY AVAILABLE for injection moulding up to 1 oz. at competitive prices. Short runs accepted. Prompt tooling facilities available. Refern, Ltd., 70 Royal Hill, Greenwich. 213-43

INJECTION MOULDING CAPACITY available on 8-oz. Reed-Prentice machine, keen prices and good service.
V. and E. Plastics, Ltd., 8 Gt. King St., Macclesfield. 213-30

CAPACITY AVAILABLE for 8-oz. " Peco " injection moulding machines. Write Box P1319, care of "Plastics." 213-21

TUBE LAMINATION AND ENGINEERING, LTD.,
HIGH WYCOMBE,
BUCKS.
MAKERS OF S.R.B.P. TUBE " LAMTUF."
LIGHT ENGINEERS.
HIGH WYCOMBE 1921-2. zzz-499

SHORT RUNS A SPECIALITY; LONG RUNS A PLEASURE. Low mould cost and overheads. Injection capacity and technical knowledge at your service. Westminster Plastics, Temple Works, 41 Old Church Rd., Chingford, E.4. Silverthorn 7927. 223-1121

Production Capacity (contd.)

INJECTION MOULDINGS
AND
PLASTIC COVERING
IN ACETATE ALKATHENE, P.V.C.,
POLYSTYRENE AND DIAKON.
MACHINED PARTS IN BRASS, STEEL AND
PLASTICS.
We solicit your enquiries.
F. A. KETCH AND SON, LTD.,
TRENT VALLEY WORKS,
LICHFIELD, STAFFS.
Phone, 3591 and 3592. zzz-500

CAPACITY AVAILABLE, 1-oz. to 3-oz. injection moulding, inquiries to Box P131, care of " Plastics." 213-7

PRODUCTION CAPACITY WANTED

ADVERTISERS wish to contact moulders with steam-heated hydraulic presses (multi daylight preferred), 20-in. by 24-in. platen minimum for regular work. Box P1332, care of " Plastics." 213-x48

RAW MATERIAL

PERSPEX! PERSPEX!! PERSPEX!!! Official stockists for I.C.I. acrylic sheets. Sheets cut to your requirements. Fabrication and mounting specialists to the trade:—
S. C. Errington (Hanwell), Ltd., 132a Uxbridge Rd., Hanwell, London, W.7. Phone, Ealing 5288. zzz-40

ALWAYS LARGE STOCKS OF
CASEIN
RODS, TUBES AND SHEETS,
PERSPEX
SHEETS UP TO 1 IN. THICK.
CELLULOSE ACETATE
CATALIN RODS.
S.R. (PLASTICS), LTD.,
93 ALDERSGATE STREET, E.C.1.
Phone, Monarch 4686. 221-1103

BRIGHT GREEN, toy colour, virgin cellulose acetate moulding powder for sale. Apply, Box P1317, care of " Plastics." 214-1130

POLYSTYRENE IMPACT, approx. 3 tons virgin, some good colours, for sale. Please inquire Box P135, care of " Plastics." 213-11

PLASTICS (MANCHESTER), LIMITED.
BRITAIN'S LEADING STOCKISTS
OF
PERSPEX SHEET, ROD, TUBE.
11 WHITWORTH STREET,
MANCHESTER, 1.
Central 7081-2 and 1000. zzz-494

BLACK CELLULOSE ACETATE MOULDING POWDER. We can always supply first-grade at 2s. per lb., any quantity. Box P008, care of " Plastics." 213-38

FOR HOME AND EXPORT MARKET. We sell at low prices all plastic scraps, Acetate, Polystyrene, Alkathene, reground powders and reconditioned powders. Apply to Box P009, care of " Plastics." 213-39

FOR SALE, 3 tons of cellulose acetate butyrate, reground. Box P1322, care of " Plastics." 213-24

RAW MATERIAL WANTED

WANTED, Polythene scrap. Write to Box P7416, care of " Plastics." zzz-0322

SURPLUS STOCKS of thermosetting and thermoplastic moulding powders wanted. Send details Box P056, care of " Plastics." zzz-481

ERLANOS, LTD., 93 Aldersgate St., E.C. (Monarch 4686), require Perspex and cellulose offcuts and scrap, clear and coloured, highest prices paid. 217-1079

P.V.C. GARMENT AND HANDBAG OFFCUTS wanted. We collect and pay cash. Brockwell Plastics, Ltd., 50 Hollingbourne Rd., S.E.24. zzz-490

PROMPT CASH OFFERED for virgin and reprocessed cellulose acetate and polystyrene. Give manufacturer's name and backing. Box P873, care of " Plastics." zzz-491

RAW MATERIALS wanted. Polystyrene, polythene, C.A., P.V.C., Diakon, reject moulds, sprues, runners, lumps, etc. Highest price paid. Prompt payment. Also spot lot origin. Box P1020, care of " Plastics." 222-1106

WANTED, large quantities regularly for export for large concern on the Continent, all types of P.V.C. scraps, granules, coloured, saran scraps, slabs, garment and handbag cuttings, nylon shavings, etc. Box P1333, care of " Plastics." 213-x9167

Raw Material Wanted (contd.)

SCRAP.
WE BUY
ALL THERMO-PLASTICS. REJECTED MOULDED PIECES. OBSOLETE MOULDING POWDERS. LUMPS, SPRUES AND RUNNERS.
AND PAY HIGHEST PRICES.
J. W. NASH AND CO., LTD.,
27 BEETHOVEN STREET, W.10.
Ladbroke 4655. 213-40

CUEX, LTD., can offer all at prices well below current list:—
Polystyrene.
Cellulose acetate.
Polyethylene.
P.V.C.
Polyvinyl butyral.
Perspex and Diakon.
Send now for details.
Cuex, Ltd., 270 Corporation St., Birmingham, Central 5474. 213-37

WANTED, large regular supplies of nylon scrap shaving. Hugh Kershaw, Oxenhope, Keighley. 214-123

NYLON SCRAP regularly purchased by users. Please, offer with samples to Box P134, care of " Plastics." 213-9

POLYTHENE AND POLYSTYRENE, any quantities of new material, scrap, nozzle lumps, urgently wanted. Please offer with samples to Herbert Connor, Ltd., 120 Beaufort Park, Falloden Way, London, N.W.11. 213-14

POLYSTYRENE. We buy surplus lots of clear and light colours, transparent and opaque, also clean scrap. Forward details to Box P139, care of " Plastics." 213-13

POLYTHENE SCRAP, natural, sprues and runners, also waste and tubing in quantities wanted. Please offer with particulars and sample to Box P136, care of " Plastics." 213-12

CELLULOSE ACETATE SCRAP, light colours and clear, not ground, continuously required. Offers invited. Box P133, care of " Plastics." 214-10

SITUATIONS VACANT

The engagement of persons answering advertisements in respect of vacant situations must be made through a local office of the Ministry of Labour, or a scheduled employment agency, if the applicant is a man betwen the ages of 18 and 64 inclusive or a woman between the ages of 18 and 59 inclusive, unless he or she, or the employment, is excepted from the provisions of Notification of Vacancies Order, 1952.

ASSISTANT CHEMIST wanted for the thermoplastic floor tile factory of the Marley Floor Tile Co., S.A. (Pty.), Ltd., at Nigel, near Johannesburg, South Africa. Permanent position with excellent prospects. Good climate. Training given in England prior to taking up South African post. Degree not essential. Good salary. Housing availability in the district good.
Apply to Technical Director, Marley Tile Co., Ltd., London Rd., Riverhead, Sevenoaks, Kent. 213-1115

PLASTICS CHEMIST
A chemist, specializing in the vinyl plastics field, is required for a position of exceptional interest with excellent prospects in a new technical service laboratory in the North West, duties will include the testing of vinyl compounding ingredients and the formulation of all types of vinyl compound. Practical experience will be given greater consideration than academic qualification, but A.R.I.C. or Ordinary degree standard is desirable.
The successful applicant will take charge of one of a small group of laboratories, and should be aged between 25 and 35. Salary will be in accordance with qualifications and experience. Box P1210, care of "Plastics." 213-1116

JUNIOR TECHNICAL SERVICE REPRESENTATIVE.
A vacancy arises for a junior technical representative to assist in the sales and technical service of a range of speciality products for the vinyl plastics industry.
Applications will be welcomed from men of 20 to 30 years of age, having a H.N.C. or Inter B.Sc. in chemistry and interested in pursuing a commercial career in a highly technical field.
Applicants must hold a driving licence, salary will be in accordance with qualifications and experience. The successful applicants will be based at Liverpool. Box P129, care of " Plastics." 213-1117

TECHNICAL SERVICE REPRESENTATIVE.
A vacancy exists for a chemist, A.R.I.C. or graduate standard, to act as Technical Representative for a Lancashire company producing a rapidly expanding range of speciality chemicals for vinyl plastics processing; commercial experience preferred but not essential. A car is provided, and salary will be in accordance with qualifications and experience. Box P128, care of " Plastics." 213-1111

CONTROL LABORATORY SUPERINTENDENT required for works of Marley Tile Co., Ltd., Harrietsham, near Maidstone, Kent. Should be familiar with control of formulation and testing of finished products. Previous experience essential. Works situated in delightful rural surroundings. Favourable pension scheme. Canteen. Housing provided if required. Write giving age, details of experience and salary to Factory Manager. 213-1114

Situations Vacant (contd.)

LABORATORY TECHNICIAN.
A position of exceptional interest, with excellent prospects, is available to a man between 23 and 40 years of age with practical experience of the vinyl plastics industry to take charge of pilot plant work (extrusion, calendering, moulding, spreading and dipping), in a new technical service laboratory in the North-West. Practical knowledge of these processes, or the majority of them, is essential, some engineering training would be of advantage, chemical knowledge is not required. Salary will be in accordance with qualifications and experience. Box P1213, care of "Plastics." 213-1109

P.V.C. CHEMIST/TECHNOLOGIST required for production control and development. Some experience of the coated fabrics industry would be an advantage but is not essential. Applications stating qualifications and salary required will be treated in confidence and should be addressed to The Managing Director, Bernard Wardle (Everflex), Ltd., Peblic Mill, Caernarvon. 213-1110

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TWO TECHNICAL SALES REPRESENTATIVES required by old-established firm of injection trade moulders. One resident in or near Manchester and to cover Northern England. The second to be resident in the Midlands and to cover surrounding territory. We have a pension scheme in operation and this is a permanent position that offers excellent opportunities to the right man able to talk and sell custom injection mouldings. Our own staff know of this advertisement. Please send full details of experience and salary expected, and any further information of personal record in strictest confidence to Injection Moulders, Ltd., Westmoreland Rd., London, N.W.9. 213-6

SENIOR TECHNICIAN required by leading plastic sheeting manufacturers. Preference will be given to applicants with a degree in chemistry or engineering. Practical knowledge of P.V.C. compounding and manufacturing processes, preferably calendering. First-class opportunity for advancement. Pension scheme. Write, giving particulars of experience, qualifications, salary required, etc., to Box P1315, care of "Plastics." 213-18

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TECHNICAL SALES REPRESENTATIVE required for London and home counties by old-established company producing compression and injection mouldings.

Applicants must have excellent personality and ability to discuss production details with buyers of industrial mouldings. A car will be provided.

Apply in writing, giving full details of career to date and salary expected, to Box P1318, care of "Plastics." 213-20

FOREMAN required for machining and fabrication of laminated materials, fibre, etc. Applicants must be able to take complete charge of all operations and be cost minded. Good salary. Superannuation. London. Box P1320, care of "Plastics." 213-22

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Vacancies caused by promotion of staff and general expansion of the company. There is good prospect of advancement.

Modern factory in good area. Non-contributory pension scheme and welfare facilities.

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VACUUM FORMING TECHNIQUES.
Working technician capable of taking charge of design and development. Must have had extensive experience in working in foils for display and packaging. A man with keenness and initiative will have great scope in a small but rapidly developing company in the North West. Own staff advised. Box P1321, care of "Plastics." 213-23

TECHNICAL REPRESENTATIVE required to develop chemical sales to the vinyl resin industry, B.Sc., or equivalent with some experience on commercial side and enthusiasm for sales development, excellent opportunity for right man with initiative and ability. Pension and profits sharing schemes.

Write full details age, qualifications, experience to date and salary desired to Ref. TVR, Box No. 8504, c/o Charles Barker and Sons, Ltd., 31 Budge Row, London, E.C.4. 214-1131

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Form of application, together with full particulars, will be sent on receipt of a stamped, addressed foolscap envelope. R. H. Currell, A.S.A.A., Clerk. 213-1

EXPERIENCED PRODUCTION MANAGER required to take charge of and develop small moulding shop with prospects of rapid expansion in technical products. Mechanical knowledge essential, some commercial experience advantageous. Box P138, care of "Plastics." 214-1127

A GOOD OPPORTUNITY EXISTS for experienced plastics chemist, with highly reputed old established company wishing to develop in this field. Reply stating qualifications and remuneration to Box P137, care of "Plastics." 214-1126

Situations Vacant (contd.)

CHEMISTS, under 30, with degree or equivalent qualification, preferably with experience in plastics, required for development work in industrial laboratories in Birmingham. Box P1310, care of "Plastics." 214-1128

REQUIRED, an experienced man, capable of taking charge of compression moulding shop, permanent and well-paid position. Apply, "Seaforth," Watchett Works, Oakhurst Road, Southend-on-Sea. 214-1125

CONTROL LABORATORY SUPERINTENDENT required for works of Marley Tile Co., Ltd., Harrietsham. 213-35

A MECHANICAL ENGINEERING DESIGN DRAUGHTSMAN is required for plant layout, maintenance and process development work in plastics manufacture.

Applicants, who should preferably possess a Higher National Certificate, should apply to The Secretary, Ashdowns, Ltd., Eccleston, St. Helens, Lancashire, giving full details of their qualifications and experience and details of salary required. 213-33

A VACANCY OCCURS for a young man in the sales department of an old-established company of plastic moulders in North London. Training given to suitable applicant before final appointment to an administrative or representative post. Apply, Sales Manager, Box P1324, care of "Plastics." 213-26

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INDEX TO ADVERTISERS

Name	Page
A	
Adamson Plastics, W. H.	84
A.E.R., Ltd.	47
Arpal (Engineers), Ltd.	74
Ashworth, Arthur, Ltd.	88
Associated Lead Manufacturers, Ltd.	53
B	
Baird & Tatlock (London), Ltd.	28
Bakelite, Ltd.	36, 48
Barber & Duffy, Ltd.	84
Beck Koller & Co. (England), Ltd.	35
Beecham Buildings, Ltd.	66
B.I.P. Engineering, Ltd.	62
B.I.P. Tools, Ltd.	32
Birkbys, Ltd.	9
Blackfriars Rotary Cutters, Ltd.	68
Blagden, Victor, & Co.	67
B.L.C. (Exports), Ltd.	82
Boake, A., & Roberts Co., Ltd.	8
Bradley & Turton, Ltd.	60
Brand, Ed., Ltd.	31
Bridge, David, & Co., Ltd.	25
British Celanese, Ltd.	33
British Electrical Development Association, The	12
British Geon, Ltd.	2
British Oxygen Co., Ltd., The	10, 55
BX Plastics, Ltd.	Inside Front Cover
Byson Appliance Co., Ltd.	80
C	
Calderon, M., Ltd.	84
Canning, W., Ltd.	83
Case Development Co., Ltd.	72
Castle, John & Co., Ltd.	80
Chamberlain & Willows	82
Cohen, George, Sons & Co., Ltd.	58
Cole, E. K., Ltd.	45
Cole, R. H., & Co., Ltd.	38
Compoflex Co., Ltd.	41
Crystalate, Ltd.	15
D	
Dixon, Arthur, & Co., Ltd.	83
Dunbar & Cook, Ltd.	80
Durable Plastics, Ltd.	84
E	
Edwards, W., & Co. (London), Ltd.	73
Electro-Methods, Ltd.	19
Elliott, E., Ltd.	27
Elm Plastics, Ltd.	80
Empire Plastics (Birmingham), Ltd.	83
Engis, Ltd.	13
Erinoid, Ltd.	Front Cover, 18
Ether, Ltd.	73
Evans, Frederick W., Ltd.	84
E.V.B. Plastics, Ltd.	61
F	
Farbwerke Hoechst A.G.	42
Ferguson, James & Sons, Ltd.	22, 81
Firth Thos., & J. Brown Co., Ltd.	64
Flexigrip, Ltd.	78
Fraser & Glass, Ltd.	57
G	
Gardner, Wm. & Sons, Ltd., Gloucester	40
Geigy Co. Ltd., The	52
Glass Yarns & Deeside Fabrics, Ltd.	67
Gosheron, John, & Co., Ltd.	75
Griffiths, Gilbart, Lloyd & Co., Ltd.	71
H	
Haigh, John, & Co., Ltd.	78
Halden, J., & Co., Ltd.	76
Harris Plastics, (Richmond), Ltd.	56
Harvey, G. A. & Co. (London), Ltd.	79
Herbert, Alfred, Ltd.	14
Hobart Manufacturing Co., Ltd., The	70
I	
Imperial Chemical Industries, Ltd., Plastics Division	17, 26, Inside Back Cover
Industrial Appliances, Ltd.	Back Cover
Injection Moulders, Ltd.	46
Insulation Equipments, Ltd.	1
K	
Kent Mouldings	76
King, Geo. W., Ltd.	43
Kleestron, Ltd.	63
L	
Lankro Chemicals, Ltd.	7
Lavino (London), Ltd.	4
London & Scandinavian Metallurgical Co., Ltd.	74
M	
Marshall, C. & C., Ltd.	80
Martin, T. G., & Co.	80
May & Baker, Ltd.	37
Melwood Thermoplastics, Ltd.	54
Mentmore Manufacturing Co., Ltd.	6
Mersey White Lead Co., Ltd.	5
Microcell, Ltd.	69
Monsanto Chemicals, Ltd.	20, 21
N	
National Plastics (Sales), Ltd.	50
P	
P.A.M., Ltd.	78
Pascall Engineering Co., Ltd., The	79
Plant Installations, Ltd.	3
Plastic Engineers, Ltd.	56
Plysu Products, Ltd.	34
Punfield & Barstow (Mouldings), Ltd.	51
Pure Chemicals, Ltd.	75
R	
Radio Heaters, Ltd.	54
Redifon, Ltd.	69
Reliance Trading Co.	83
Resinoid & Mica Products, Ltd.	79
Resinous Chemicals, Ltd.	44
Rootes Mouldings, Ltd.	59
S	
Sale, H. B., Ltd.	68
Scott Bader & Co., Ltd.	16
Shaw, Francis & Co., Ltd.	65
Shell Chemicals, Ltd.	29
Simmonds Aerocessories, Ltd.	11
Simon, Henry, Ltd.	30
Souplex, Ltd.	82
Spicers, Ltd.	76
Steele & Cowlishaw, Ltd.	77
Stevens, Michael, S.	84
Sturge, John, E., Ltd.	83
Styrene Products, Ltd.	18
Synthite, Ltd.	24
T	
Textile Paper Tube Co., Ltd., The	58
Turner Bros. Asbestos, Co., Ltd.	77
U	
U.K. Plastics, Ltd.	78
United Ebonite & Lorival, Ltd.	23
Utilex, Ltd.	71
V	
Vacuum Industrial Applications, Ltd.	39
Vulcan Boiler & General Insurance Co., Ltd., The	70
W	
Westbury Engineering Co., Ltd.	72

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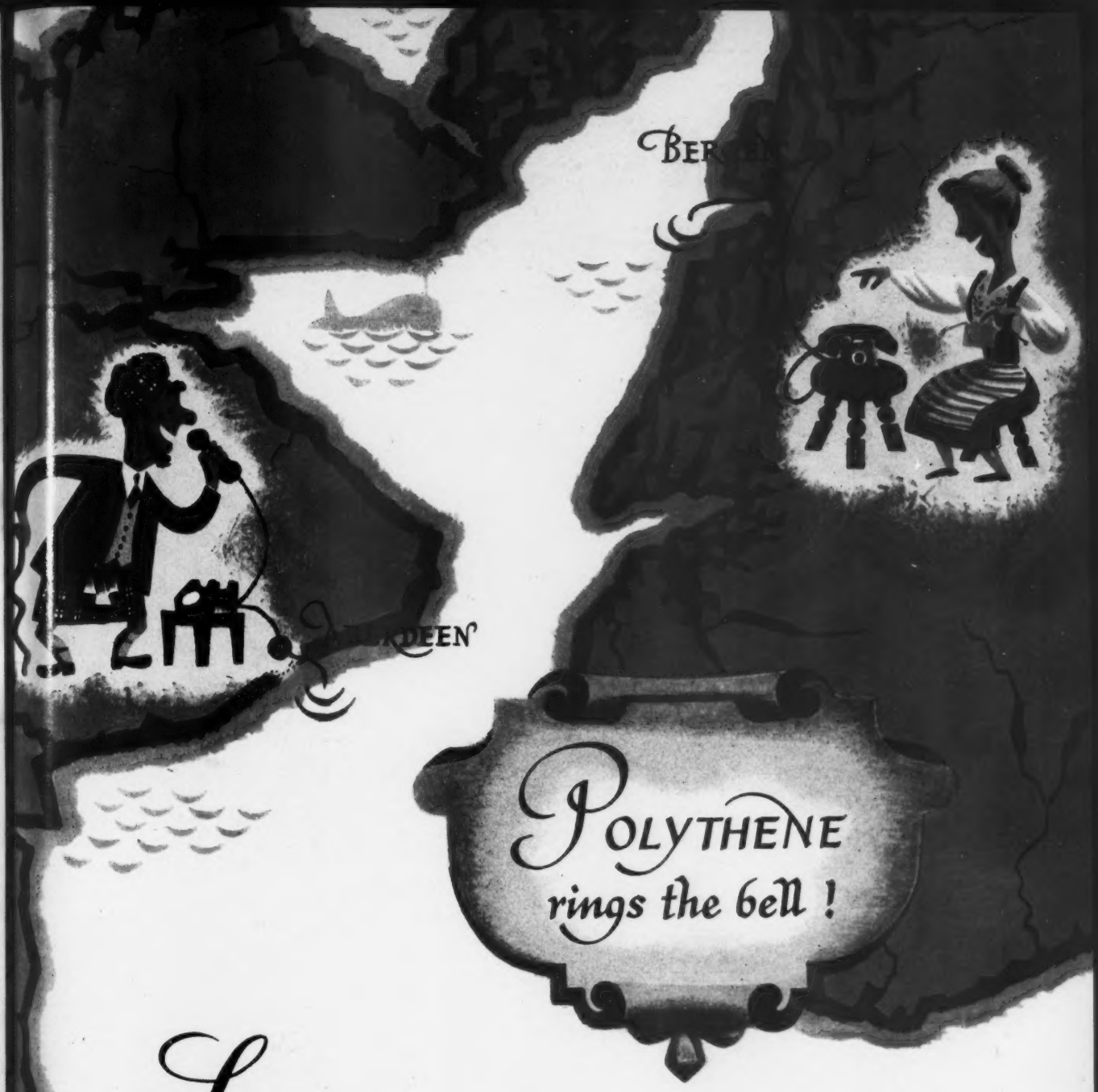

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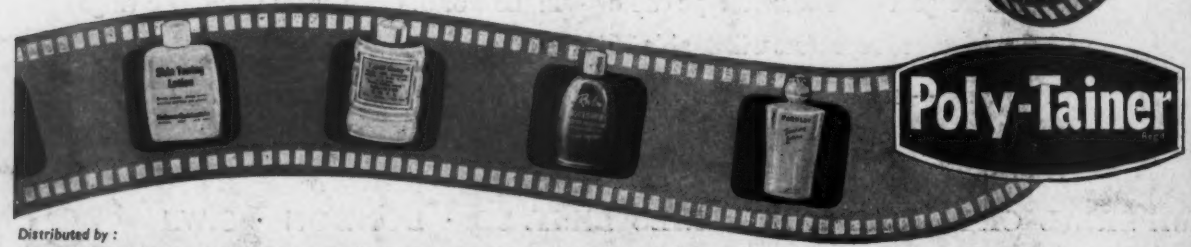

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